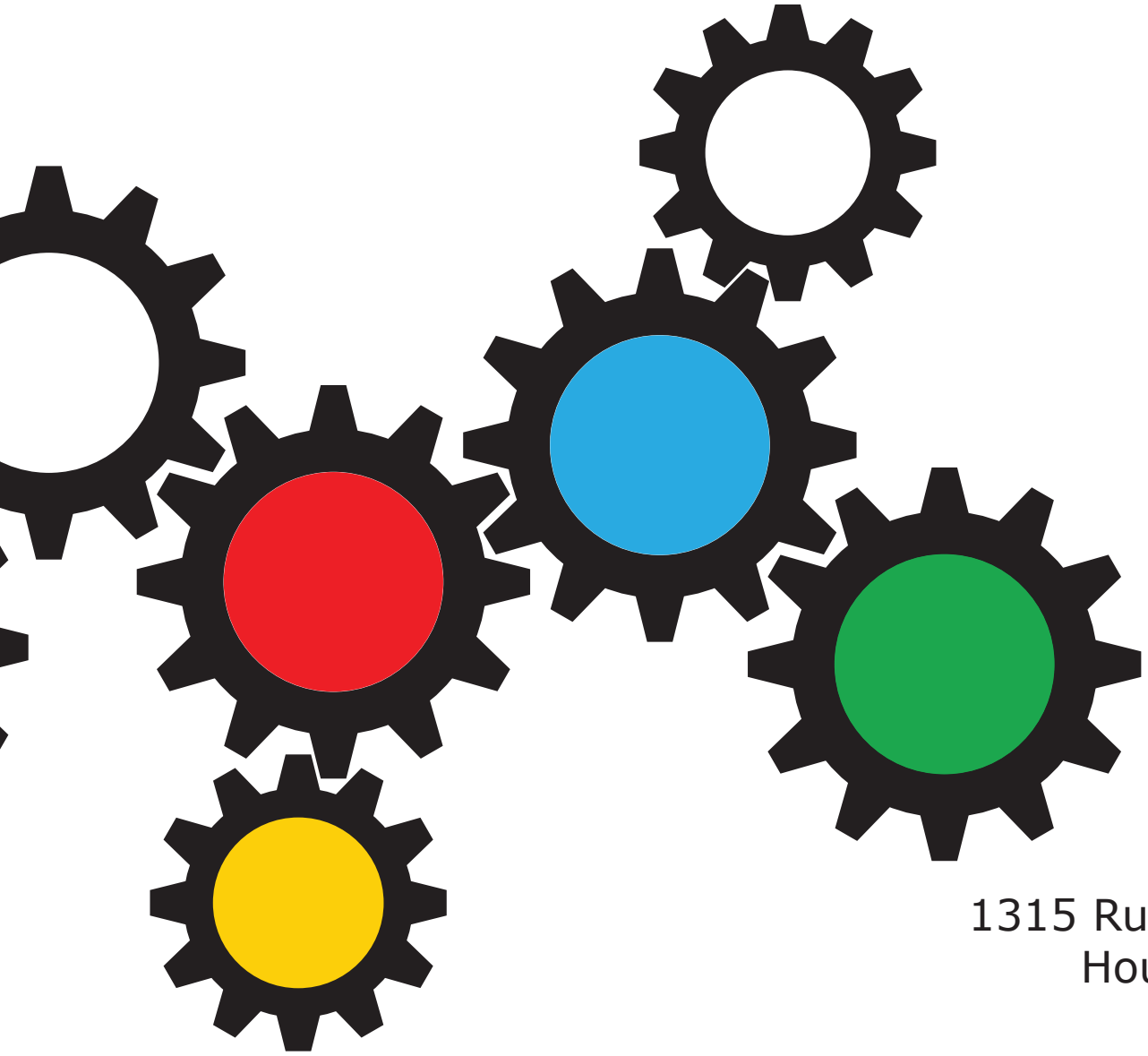
Michael Senkow

Mechanical Engineering with
Scientific and Technical Communications



1315 Ruby Avenue
Houghton, MI
49931

mhsenkow@mtu.edu
(906)281-4672

Engineering Communication

If you are reading this,

I am providing this portfolio as a means to display the work I've done in a variety of fields. While my primary degree in school was in Mechanical Engineering, I have also had experience in a number of areas connected to communication. These range from:

- Editing
- Graphic Design
- Writing
- Photography
- Marketing work
- Public Relations work

Together these have supported my engineering work along with allowing me to be active in a number of organizations and jobs that require in-depth communications work.

If you have any questions about individual pieces feel free to e-mail me or call for further information.

~Michael Senkow

Michael H. Senkow

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11 Scottfield, Allston, MA 02134

Mechanical Engineering combined with Technical Communications

Experienced in 3D modeling, Process Engineering, Graphic Design, Photography, and Public Relations

EDUCATION

Michigan Technological University, Houghton, MI
Bachelor of Science in Mechanical Engineering, May 2009
Bachelor of Science in Scientific and Technical Communication, May 2009 Cumulative GPA: 3.4

Finlandia University, Helsinki, Finland (Summer 2008)
Study abroad program, including travel in Finland and Estonia
to conduct comparative research on railway systems

ENGINEERING PROFESSIONAL EXPERIENCE

Kimberly Clark, Neenah, WI *Process Engineer Co-op* 2007 – 2008
- Evaluated optimal nozzles and adhesives to reduce product costs
- Determined material strength through tensile test frames, as well as running speed on the High Speed Bonding Line
- Proposed changes that would result in savings of $2,000,000 annually

Michigan Tech Aerospace Enterprise, Houghton, MI *Research Associate* 2007 – 2009
- Completed research on the 3-D model of Satellite *Oculus* and conducted FEA analysis to determine optimal structure sizes
- Created battery of marketing and graphic pieces, available for review upon request

West Engineering Computing Network, Houghton, MI *IT Support Staff* 2004 – 2007
- Aided students in promptly and effectively resolving IT problems in the Linux and Sun labs

COMMUNICATIONS PROFESSIONAL EXPERIENCE

Michigan Tech Marketing and Communications, Houghton, MI *Graphic Designer* 2008 – 2009
- Created branding materials with connecting themes such as banners, posters, truck covers, and logos
- Worked in a fast paced environment, with set deadlines, often times within a few hours

Michigan Tech Writing Center, Houghton, MI *Communications Coach* 2006 – 2009
- Taught students motivation, confidence and written/verbal communication skills through coaching sessions
- Mentored International Students, improving their English communication skills

Michigan Tech "Making Our Mark" Program, Houghton, MI *Writer and Coach* 2007 – 2009
- Wrote on the college experience, inspiring future students, and coached seven future authors

LEADERSHIP EXPERIENCE

Michigan Tech Orientation Team Leader
Mu Beta Psi National Honorary Music Fraternity Member and Michigan Tech Music Department Fundraiser
Make A Difference Community Service Day Volunteer
Canterbury House Volunteer
General Technics Science Group Member
Jazz R&D Band and Swing Dance Club Member
Keweenaw Pride Group Public Relations Director, including extensive public speaking experience
Leadershape Graduate

TECHNICAL SKILLS

Proficient in Windows and Mac OS, as well as Sun Microsystems, Linux, MS Office applications, Java, C++, MATlab, Mathematica, IDEAS, Unigraphics, some ProE and Solidaworks, Photoshop, Illustrator, InDesign, Quark

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Technical Writing:

Self Powered Mower, Design and Analysis

The following piece was written for ME 3502, Product Realization II. It details the design, analysis of various parameters, and possible creation of a self powered, riding reel mower. It was written as a purely hypothetical act, with no actual mower being produced, but the design of the document was written to mirror an official engineering technical report.

Graphics were chosen to be simple yet informative, with only a few extraneous graphical elements. Writing was kept to a direct and simple style, and intensive editing was performed by me to make sure few mistakes were made.

The lessons learned in this document have been used in later reports, for classes such as ME3000, Energy Lab; ME 4990, Senior Design; and ENT 4960, Aerospace Enterprise.

Self Powered, Riding Reel Mower

Bryan Freed, David Sutton, Michael Senkow, John Scott

July 25th, 2007

Dr. John Beard, Instructor

Michigan Technological University

Abstract

This paper describes a human powered, bike, reel-mower. There is discussion on the parts chosen to design the final structure, on the selection of gears for providing proper power, and on selecting the ball bearings and shaft that will support the mower. Models of the parts used are displayed, along with the variance in velocity due to changes in gearing.

Introduction

The photo displayed on the front of this paper is the initial concept for this project. The goal is to design a self powered, riding reel mower, which is non-polluting and provides a form of exercise for the user. Certain requirements were followed in the project:

- It uses a flywheel to store energy for the reel blades.
- It must reverse, and the reels must continue to cut, while reversing.
- It must have three forward speeds independent of the reel speed.
- It must be a three wheeled vehicle.
- It must steer.
- It should be compact.
- The reel will be constructed separately.

It was determined that, to solve this project, an alteration to an existing tricycle would be created. While the project called for a more compact vehicle, and it did not state any goals relating to the vehicle being useful for other household chores, it was decided that a vehicle that was strong enough to support both the mower and possible additional object (fallen tree limbs, rocks, bagged grass or leaves, etc) would be more useful. The bicycle shown in Figure 1 was chosen, due to the primary structure strength. Brakes already come as part of the current structure, and the dimensions allow the cycle to fit through most doors. Also, the current steering system is more than adequate for our design.

Figure 1. Hefty Hauler from Industrialbicycles.com

The alterations to the rear portion of the bicycle were decided upon with a base energy input of 0.18 hp, the average Power a human can put into a riding bicycle, and a reel speed of 400 rpm, the average speed of a number of electric reel mowers. A set support load of 200 lbs safety factor was chosen for the rear shaft, to allow that both the mower and an additional weight could be supported.

The product is designed for customers with yards large enough to warrant a machine larger than a simple push, reel-mower, and who wish to mow at a comfortable pace, while helping the environment. Future designs will take into account the entire vehicle, rather than altering an existing one.

Analysis

Front Crank Shaft

Initially, the primary concern focused on deciding upon what type of gears to use and in what arrangement to power both the bike's velocity and the rotational speed of the reel. A target was set for the reel, of 400 revolutions per minute, approximately the same speed found on electric reel mowers, and a low forward speed was decided to be acceptable, in the 2-4 mph range.

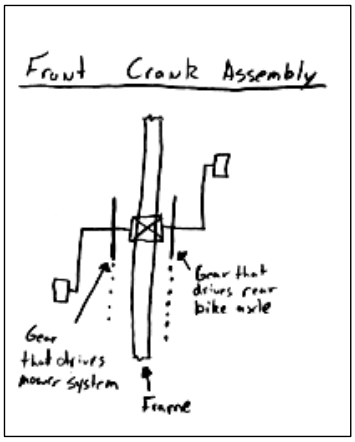

Figure 2. Positioning of Crankshaft gears

To simplify the arrangement of gears, one side of the crank-shaft will power the reel-related gears, while the other side will power the bikes velocity, as seen in the preliminary sketch of Figure 2. From this point, the gears will attach to the rear shaft assembly through the use of an off-the-shelf bike chain, or roller chain. We did not do calculations on the chain, due to lack of information on the chain strength being available through sales locations and research showing that generally, a bike chain breaking under normal use is extremely uncommon. Turning a bike into a lawnmower may not be normal use, but it shouldn't strain the chain more than a vigorous mountain bike trail would.

Rear Gear Assembly, Bike Locomotion

From this front crank shaft arrangement, a set rpm of 60 was set. This is the average rpm a healthy human would be expected to be able to produce. The crank is attached to the rear gear assembly, which is shown in Figure 4. A cluster with threaded on freewheel, similar to Figure 3., will have to be created that is a conglomeration of a 3 gear cassette and a fourth one, which is connected backwards. Bike gears tend to work with a ratcheting system, so the fourth gear is set in reverse to allow for reverse movement. A slightly lengthened derailleur will be used on these gears, and can generally be found off the shelf of most bike stores. As a note, the shaft powering the reel will also be set with a ratcheting system. The smaller gear found next to the flywheel will be freewheeling. This prevents the flywheel from affecting the crankshaft. This second grouping of gears relates to the reel. Its configuration can be seen in Figure 5. The full gear assembly layout can be seen in Figure 6. The crankshaft is not in the final position it will be on the bike, but is being displayed on the top for conceptual purposes. All these components are set on 1 inch shafts, determined partly by commonly sold component requirements, partly by bearing size, and partly by this diameter being more than strong enough to support standard weights.

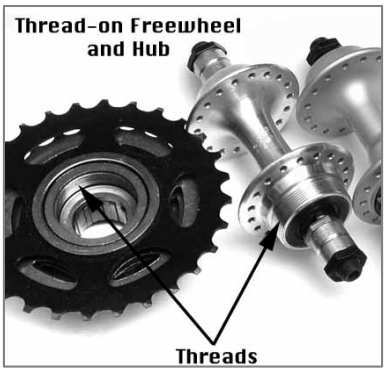

Figure 3. cluster w/ flywheel

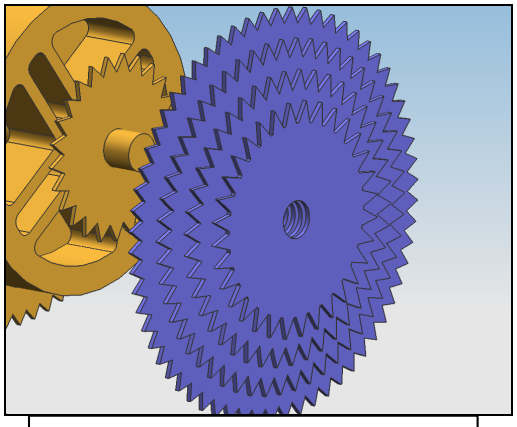

Figure 4. Locomotion Gear Assembly

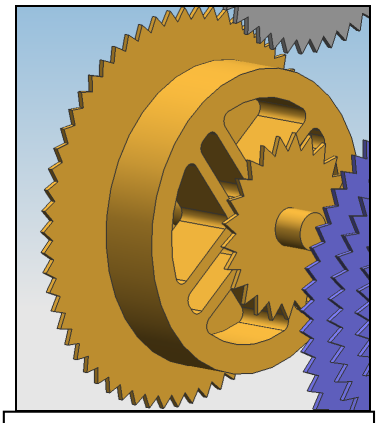

Figure 5. Reel Gear Assembly

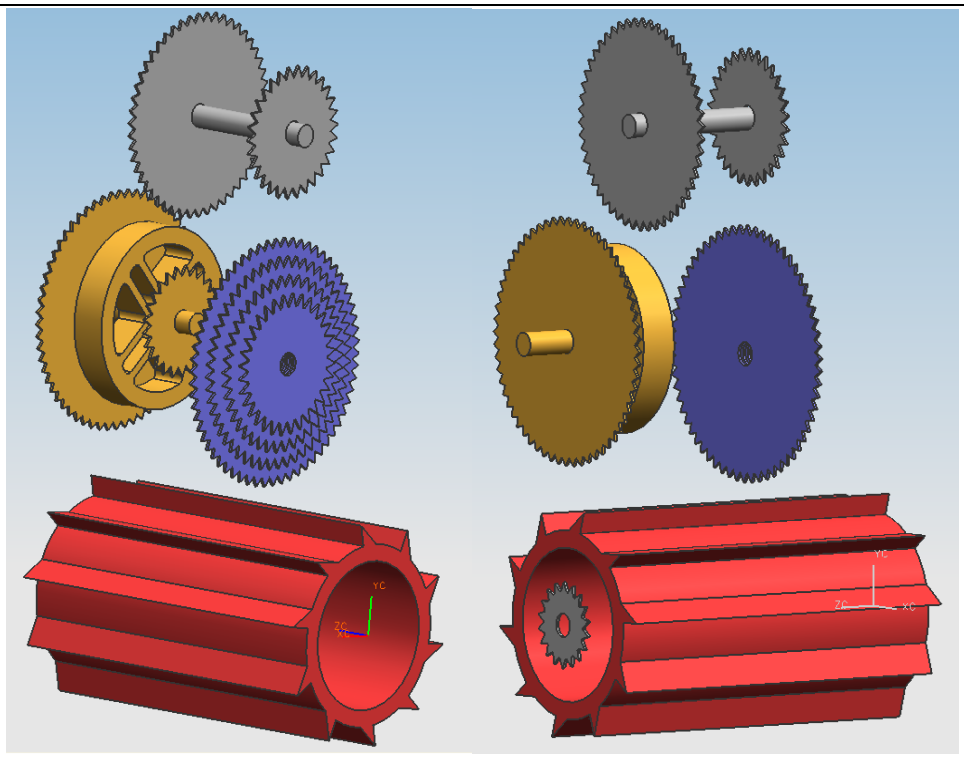

Figure 6. Full gear assembly, left and right view

Gear Attributes

For choosing the gears, we used two primary equations. Arbitrary tooth counts were chosen, with tpi ratios of 0.5, the commonly seen tpi on most bicycle gears. These were put into equations:

$$\omega_1 d_1 = \omega_2 d_2 \qquad \text{and} \qquad tpi = \pi d/N$$

with N being the number of teeth, and ω being the angular velocity or rpm. For the locomotion gears, their information can be seen in Table 1.

	No. Teeth	rpm	Diameter (in)	TPI
Crank	30	60	4.77	0.5
1st Gear	32	56.25	5.09	0.5
2nd Gear	42	42.86	6.68	0.5
3rd Gear	52	34.62	8.28	0.5
Reverse Gear	62	29.63	9.87	0.5

Table 1. Locomotion Gear Parameters

Conclusion

The calculations we have done will produce the preliminary structure of a bike/lawnmower. Most of the mechanisms will be similar to that of a bicycle, with a crankshaft in the front that powers the gears, the use of a derailleur to shift between gears, and the use of other common parts, such as the two clusters, one put on in reverse for the reverse gear, and the off-the-shelf bike chain.

Overall, sections of the design could be reduced. The shafts and gears decided upon are larger then what is absolutely required, but this is largely due to the fact that standard sizes are more available then the possible bare minimum sizes. The use of off-the-shelf parts will greatly reduce any cost encountered. Also, while we were designing this product to compete with an electric reel mower, the true power output will depend on a number of factors. A stronger individual, proper oiling, and longer crankshafts will all increase the possible power and thus more efficient cutting speed.

References

1. Juvinall, Robert C. and Kurt M. Marshek. Fundamentals of Machine Component Design. United States of America: John Wiley and Sons, Inc. 2006

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David Sutton – dcsutton@mtu.edu

Michael Senkow – mhsenkow@mtu.edu

John Scott – joscott@mtu.edu

Technical Writing:

Kimberly-Clark Internship Final Report

While on Co-op at Kimberly-Clark, part of my primary project involved creating a final presentation, along with a formal document which detailed all my findings. Similar to other reports I've created for Engineering courses, this document had very strict standards and guidelines, set down by the company.

Graphical elements were restricted to charts, pictures of test samples, and examples of adhesive bonding. A very set, formal research document layout was used, with the primary purpose to create a document that the reader would be able to repeat the experiments.

Abstract

This study compared the peel strength, bleedthrough rate, and visible alteration that resulted from adhesive application in the materials most commonly used in Supreme diapers. An Outer Cover Lamination process, in which the adhesive was sprayed on the spunbond and laminated to the poly-film, and a Main Construction process, in which the adhesive was sprayed on the poly-film and laminated to the spunbond, were both tested. The tests were run on the High Speed Bonding Line (HSBL) at KCPX to better simulate actual product conditions. The tested variables included add-on levels, adhesive type, nozzle, and type of poly-film, while the set variables included the open time, web speeds, substrates, and nozzle heights. It was found that of the three nozzles being tested, Summit™, Signature™, and Slotcoat, Slotcoat nozzles had the highest peel strengths with Summit nozzles performing mildly better than Signature nozzles. The two adhesives used had similar peel strengths, with RT8723 having marginally higher peel strengths than National 345610. The bleedthrough had similar levels, with Slotcoat nozzles producing less bleedthrough than Summit or Signature.

Keywords: Huntsman, RT8723, National, 345610, Signature™, Summit™, Slotcoat, Supreme, tAPAO, Clopay, Peel Testing, Bleedthrough

™: Signature and Summit are trademarks of Nordson Corp, Dawsonville, GA. USA

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Executive Summary

This project was performed by Michael Senkow under the direction of Don Smith. The tAPAO Construction Adhesive on Supreme diapers project objective is to demonstrate that combining new nozzle technology with best-in-class centerlined process can enable this cost saving project to proceed without a negative impact on appearance or the production of stuck-together defects.

The trials were designed to test six primary configurations, displayed in Table 1.0. These configurations were tests on both an Outer Cover Lamination process and a Main Construction process. Variables involved in the processes included three set add-on levels for both the Outer Cover and Main Construction and two poly-films which were tested on the Outer Cover. Other variables in the trials were fixed, with web speed, open time, nip roll pressure, adhesive temperatures, nozzle height, and other materials being based after the commonly used settings found in Supreme diaper manufacturing. Air pressure was optimized for each trial so as to best apply the adhesive with each nozzle.

Current National Starch 34-5610 / Summit™	Test 1 Huntsman RT8723 / Summit™
Test 2 National Starch 34-5610 / Signature™	Test 3 Huntsman RT8723 / Signature™
Test 4 National Starch 34-5610 / Slotcoat	Test 5 Huntsman RT8723 / Slotcoat

Table 1: Adhesive/Nozzle Combinations

Peel tests were performed on samples taken from each trial, along with bleedthrough tests and quantifying of the visual displays of bleedthrough. In the peel tests, peak strength, average strength, and standard deviations were recorded for individual samples and the averages of each nozzle combination's three add-on levels. The manner in which peel failure occurred was also recorded, with observations being made on whether the substrate or poly-film failed and to what degree. The bleedthrough tests displayed a comparative display of how much force was required to strip a third material from the two primary constructions, which would have bonded due to bleedthrough. The visual testing portion quantified the number of bleedthrough holes that occurred during the Main Construction process and making a general observation of how much damage had occurred. This portion was only performed on the Main Construction due to greater damage being assumed to occur when the adhesive is applied directly to the poly-film.

Introduction

This study was set up to determine if the current nozzle and adhesive used in Supreme diapers can be replaced by a less expensive process that may have better bonding potential. Factory settings used in diaper manufacturing were duplicated as closely as possible, using the High Speed Bonding Line (HSBL) at Kimberly-Clark Prototype and Experimental Facility (KCPX).

Initially, the fixed variables were decided upon. The web speed was set at approximately 1100 feet per minute (fpm), the low end of commercial production speeds. This speed was easily attained on the HSBL. A slower speed of 600 fpm was used for the bleedthrough tests due to tearing issues that occurred. Nozzle height was set at a recommended level of 2.5 inches for Summit and Signature nozzles, and properly positioned against the matrix for the Slotcoat nozzle. Adhesive temperatures were based upon recommendations for optimal application, with National 34-5610 being applied at temperatures of approximately 320°F and Huntsman RT8723 being applied at 335°F. Adhesive application air pressure's and nip pressures were also based upon optimal recommendations, with nip pressures being set at 60 psi and air pressures ranging from 20-30 psi for Signature and Summit nozzles.

	Web Speed (fpm)	Nozzle Height (in)	Temp. (°F)	Nip Pressure (psi
Outer Cover	1100	2.5	320-335	60
Main Construction	1100 (600 for bleedthrough)	2.5	320-335	60

Table 2: Fixed Variables

The testing variables included add-on levels, nozzle type, adhesive, and the type of poly-film being used. While the poly-film was not a primary testing variable, Clopay and 8635Y were compared only in the Outer Cover Lamination process, due to the limited amount of Clopay being available during this period.

Add-on levels were based on production levels, measured in grams per square meter (gsm). Upper and lower limits were also tested to determine if variability occurred in peel strength depending upon add-on and to see if a lower amount of adhesive for one nozzle may work as well as the current situation.

The tested nozzle types included Summit, Signature, and Slotcoat nozzles. Adhesives are currently applied with Summit nozzles, but previous studies indicated that Signature nozzles were more robust, with fewer issues appearing in the application process.

The testing trials were run between October 8th and November 19th on the HSBL line with operators Jeff Swoboda and Dan Wideman at the K-C Prototype and Experimental Facility. Samples were collected from each trial run and bleedthrough tests were run. The bleedthrough tests displayed the amount of adhesive bleedthrough that occurs in operation with the different nozzle/adhesive combinations.

Peel testing sample prep involved creating eight samples for each add-on level for each nozzle and adhesive combination. Each sample was cut three inch wide (CD) by nine inch long (MD), with a taped backing on the poly-film side. The taped backing was used to better reproduce actual adhesive peel strength and remove the possibility of negative effects being introduced by poly-film stretching. Samples were prepared and tested according to STM-5599 which follows the T-peel style of peel testing, seen in Figure 0.

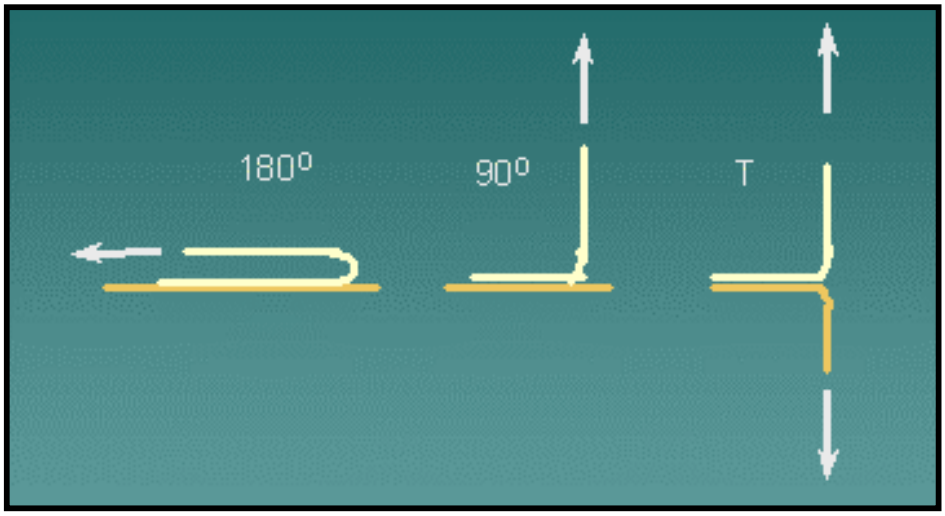

Figure 0: Visual sample of Peel Test forms

Samples for peel testing were prepared and run through the MTS® tensile tester (KC #00032) using the TestWorks software to collect the data. Testing observations included the peel force required to delaminate the strips, amount of spunbond failure, and amount of poly-film failure. Aged peel testing was performed after samples had been aged in the accelerated aging chamber at KCPX, in which the samples were heated at 55°C low humidity for two weeks.

The testing measurements and notes will be the basis for decision on which nozzle and adhesive combinations have the best strength capabilities and least amount of bleedthrough effects.

Bleedthrough Testing – Main Construction

This section of bleedthrough testing was done at a lower speed than the Outer Cover. Attempts to run the bleedthrough testing at full diaper manufacturing web speeds of 1100 fpm resulted in massive material destruction. This was due to the higher add-on levels involved and larger excess globules of adhesive forming and collecting onn the forcebar. The trials would not perform with useful results until the web speed was reduced to 600 fpm. This still reflects an accurate comparison between the different nozzles and adhesives, but does not compare directly to the testing done on the Outer Cover, so it would not be accurate to compare the values between these two tests. The way in which the materials were set up on the HSBL testing line was also changed in this process, and a generalization of the set-up can be seen in Figure 3.

In the bleedthrough testing, Slotcoat nozzles displayed the lowest amount of bleedthrough, followed by Signature, and Summit. This comparison can be seen in Chart 23 and is further supported by the visible evidence found in the visual testing section. The same relation is seen though, as in the bleedthrough testing done on the Outer Cover. Slotcoat nozzles display a lower bleedthrough than either of the other two, and it can be assumed that in the prior test, seen in Chart 11, Signature would have displayed a bleedthrough level in between Summit and Slotcoat.

In comparing the adhesives, there was a slight increase in the amount of bleedthrough for RT8723 for both the Summit and Signature nozzles. Slotcoat nozzles displayed nearly identical amounts. A direct comparison between the two adhesives can be seen in Chart 24 and best displays the slight increase in bleedthrough for RT8723.

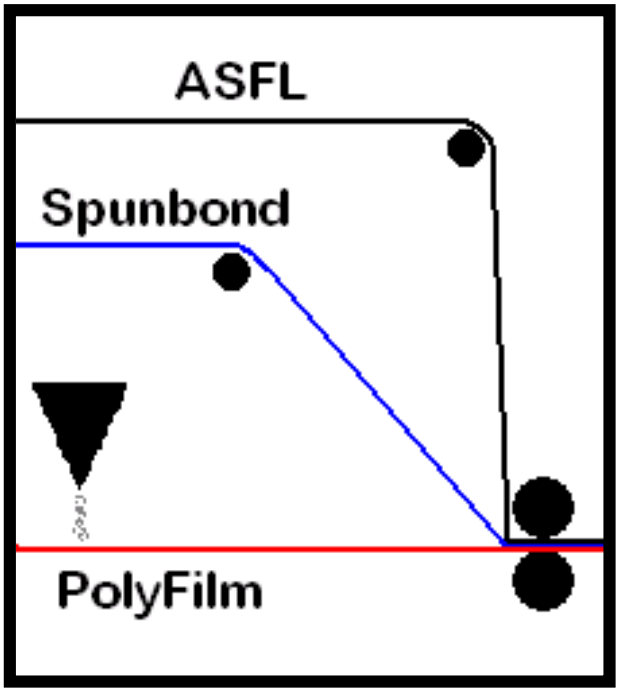

Figure 3: Bleedthrough Testing Setup on Main Construction

Personal Writing:

LODE informative articles

As part of my work at Michigan Tech, I have been involved in GLBTA leadership. Part of this work has taken the form of writing for the various publications on campus. The following two pieces are examples of letters written for the opinion section, created to incite discussion and directed at different audiences.

The first was created to cause those who are closeted to reflect on what they are doing with their lives. This letter was also used as a alternative (and free) form of advertising for upcoming Pride Week events.

The second was created soon after the elections that occurred in California over Proposal 8. Michigan Tech often is out of the circle in relation to national political events, so the article was written to inform MTU students, many of whom had no idea that across the nation certain human rights were being erased.

Dear Editor,

Harvey Milk said, “I cannot prevent anyone from getting angry, or mad, or frustrated. I can only hope that they’ll turn that anger and frustration and madness into something positive, so that two, three, four, five hundred will step forward, so the gay doctors will come out, the gay lawyers, the gay judges, gay bankers, gay architects … I hope that every professional gay will say ‘enough,’ come forward and tell everybody, wear a sign, let the world know. Maybe that will help.”

I’ve written for the Lode a few times, speaking on various events happening in the country in relation to Gay, Lesbian, Bisexual, Transgender and Ally (GLBTA) activism, such as the passing of Prop 8. in California and how Michigan banned same-sex marriage a few years ago. Generally my audience is the straight population on campus, hopefully getting people to think about a subject that does not always affect their everyday life.

This time I wish to direct my opinion towards those of you who are closeted. Although it is not a very large audience among 7,000 students and a couple hundred more faculty, there are significantly more GLBTA students and adults on campus than you would expect.

In a few weeks, we’ll be trying to bring the movie “Milk” to campus, a film about the first openly gay male to be elected to public office in California. Harvey Milk helped change the face of the country in his short time in office as City Supervisor in San Francisco and brought down bills that may have prevented gay men from being teachers and passed stringent gay rights ordinances for the city.

Harvey Milk was just over 40 when he first started coming out and took his first steps into politics. In just a few short years, he went from a closeted nobody to a face that changed history.

To those who are closeted on campus: what are you waiting for? Do you think it will get easier after college to come out? Yes, you have other things to focus on: your grades, your student groups, your fraternities and religious orgs. While you wait, events are passing in the country. I wasn’t out to my family when Proposal 2 passed in Michigan, putting into Michigan’s constitution that marriage is only between a man and a woman. I wonder who in my family voted to remove one of my rights because they didn’t know I was gay. People think harder about “defense of marriage” Acts when they realize how close they are to someone it is affecting.

You don’t have to come to KP or even put almost any effort forth, but do something, though. Tell your fraternity brothers, tell your religious groups, tell your friends and coworkers, come out on Facebook even – just don’t sit there and let life pass you by. I’ve spoken to a number of alumni who were not out as students but who came out in their 30s or 40s and went through false marriages before they finally got things straight. Almost continuously I hear the message that they wish they had come out sooner and that they wish they hadn’t wasted so many years that they could have spent really finding themselves. Every day though, I walk across this campus and see people who I’ve either chatted to randomly on a gay personals site, who messaged me on Yahoo! and thought I wouldn’t be able to figure out who they were after they told me their major and last name or who for various reasons I know are closeted and gay, and I wonder, are they happy?

In the end, I’m an engineer, and while I enjoy writing, I am not always the most eloquent. If you’re a senior or a grad student, a professor or a freshman; just think about it: do you really want to be 40 and look back and wonder – why didn’t I come out sooner?

Sincerely,

Michael Senkow

Graphic Design:

Aerospace Brochure

In the Aerospace Enterprise, I have taken part in both the primarily Engineering related Structures team, and in the Marketing Team. Much of my contribution included an extensive library of photographs for the group, producing a more interesting logo, and creating a number of advertising documents, such as brochures.

I produced the logo shown in Figure 6 by adapting an older, simpler logo. My design combined the original logo with an image of the earth, altered to highlight Houghton's position on the planet, in a way that would never be viewable from space.

Along with this, two brochures have been created, to highlight the different aspects of the largest team in Aerospace, Oculus, along with general attributes of all the smaller teams. These can be viewed in Figures 6 and 7. They were both created to vaguely mimic the look of NASA produced material, tying in the connection between the Aerospace Enterprise's goals and their sponsoring company.

Figure 1: The Aerospace Logo

The Logo was created with an image of earth that focused on Houghton and had to be created. This image unfortunately was too wide for most marketing material and had to be narrowed, as seen in Figure 7.

The brochures on the following pages were made to be simple enough that other people in Aerospace, when I am gone, will be able to edit them easily and add altering information. They have helped spawn similiar projects for the organization, such as newsletters and posters that have similar themes.

Figure 2: Banner Version

Sponsors

SAIC
From Science to Solutions

WIND RIVER

Raytheon

NASA

AFRL AIR FORCE RESEARCH LABORATORY

Integrity Applications Incorporated

agi
Analysis software for land, sea, air, & space

ABSL SPACE PRODUCTS

C&R TECHNOLOGIES
Hot Engineering . . . Cool Software®

•How do I sign up?

If you are interested in joining, speak to your advisor, and sign up for the enterprise class through Banweb. Aerospace Enterprise has the potential of fulfilling certain Senior Level courses.

Section L21

Freshman 1st semester ENT1950, 2nd semester ENT1960

Sophmore 1st semester ENT2950, 2nd semester ENT2960

Junior 1st semester ENT3950, 2nd semester ENT3960

Senior 1st semester ENT4950, 2nd semester ENT4960

•What majors are we looking for?

Every major is welcome, but ones related to Engineering, Communications, Business, Computer Science, and Technology will be the most practical.

•Most common Majors:

Mechanical Engineering, Electrical Engineering, and Computer Science.

When you sign up for the course you will be put on the class mailing list , from there you will be notified of our first meeting of the semester. If you sign up for the class after the first week of class please contact the president.

If your major is not one that requires you to either take senior design or Enterprise please get a class override form and contact the President, Jason Julien at jmjulien@mtu.edu for further instructions.

Contact Information

Jason Julien, Enterprise President
at jmjulien@mtu.edu
–or–
Dr. Brad King, Enterprise Advisor
at lbking@mtu.edu
www.aerospace.mtu.edu

Michigan Tech

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(906) 487-1885

Michigan Tech Aerospace enterprise

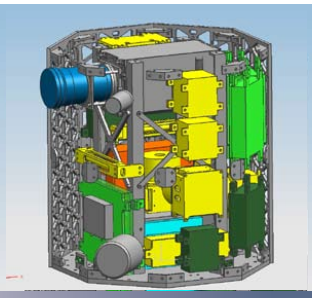
The Oculus Project

The Oculus, meaning "The Eye" in Latin, is a satellite currently being built for the University Nanosatellite Competition. The entire satellite is designed and manufactured at Michigan Tech by undergraduate students.

The Oculus Project is currently the largest project in the Michigan Tech Aerospace Enterprise with more than 70 members from a variety of majors. Every student takes part in working within one or more sub-teams which make up the Oculus Project:

- Guidance Navigation and Control (GNC)
- Power
- Telecommunications
- Imagers
- On-Board Data and Command (OBDC)
- Structures

In joining the Oculus Project students collaborate with industry sponsors such as the Air Force Office of Scientific Research (AFOSR), Air Force Research Laboratory's Space Vehicles Directorate (AFRL/VS), and American Institute for Aeronautics and Astronautics (AIAA). Students also get the opportunity to work with industry sponsors such as Raytheon, SAIC, ABSL Space Products, Wind River, and AGI.



The Mission

"The Oculus Mission is to develop and demonstrate a nanostatellite platform capable of acquiring, imaging, tracking, and monitoring resident space objects." The Oculus is designed around Space Situational Awareness (SSA) and will be capable of detecting not only resident space objects, but also cubesats deployed from the vehicle. The project was given $110,000 to design and build the nanosatellite which furthers small satellite R&D of interest to the AFRL

What We Do

- Design sophisticated components in CAD programs
- Take raw Aluminum and create parts from CAD models
- Test antenna gains and gain patterns in an anechoic chamber
- Design and build PC104+ computers
- Create software that controls 30+ pieces of hardware simultaneously
- Design radios to communicate 500km
- Work with cutting edge technology
- Component testing in Vacuum chambers

Until We Reach Space

- Oculus has been in a two year competition sponsored by AFOSR and managed by the AFRL.
- Flight Competition Review (FCR) will take place in Albuquerque, New Mexico
- Travel opportunities for members include Colorado, Utah, New Mexico, and Washington DC
- Endless opportunities for students to network with potential future employers

Some Related Courses

- Electro-Magnetic (E-Mag)
- Integrated Design & Manufacturing (IDM)
- Thermodynamics
- Microcontrollers
- Orbital Mechanics
- Fluid Dynamics
- Digital Signal Processing (DSP)
- Communication Theory
- Antenna Design
- Circuits
- Electronics
- Business Management
- And more!

Figure 3: Oculus Brochure

Sponsors

SAIC
From Science to Solutions

WIND RIVER

Raytheon

NASA

Air Force Research Laboratory

Integrity Applications Incorporated

agi
Analysis software for land, sea, air, & space

ABSL
SPACE PRODUCTS

C&R TECHNOLOGIES
Hot Engineering . . . Cool Software®

•How do I sign up?

If you are interested in joining, speak to your advisor, and sign up for the enterprise class through Banweb. Aerospace Enterprise has the potential of fulfilling certain Senior Level courses.

Section L21

Freshman 1st semester ENT1950, 2nd semester ENT1960
Sophmore 1st semester ENT2950, 2nd semester ENT2960
Junior 1st semester ENT3950, 2nd semester ENT3960
Senior 1st semester ENT4950, 2nd semester ENT4960

•What majors are we looking for?

Every major is welcome, but ones related to Engineering, Communications, Business, Computer Science, and Technology will be the most practical.

•Most common Majors:

Mechanical Engineering, Electrical Engineering, and Computer Science.

When you sign up for the course you will be put on the class mailing list , from there you will be notified of our first meeting of the semester. If you sign up for the class after the first week of class please contact the president.

If your major is not one that requires you to either take senior design or Enterprise please get a class override form and contact the President, Jason Julien at jmjulien@mtu.edu for further instructions.

Contact Information

Jason Julien, Enterprise President
at jmjulien@mtu.edu
–or–
Dr. Brad King, Enterprise Advisor
at lbking@mtu.edu
www.aerospace.mtu.edu

Michigan Tech

1400 Townsend Drive
Houghton, Michigan 49931-1295
(906) 487-1885

Aerospace Enterprise

Currently made up of 110+ students that range from marketing majors to electrical engineering majors, all our members contribute towards achieving specific project goals, developing valuable personal skills that will help students gain work experience before they start to work for industry.

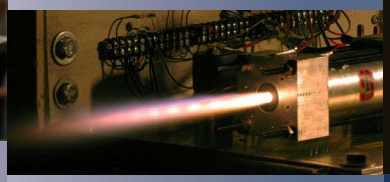
The Oculus Project

The Oculus Project is currently the largest project in the Michigan Tech Aerospace Enterprise with more than 70 members from a variety of majors. Every student takes part in working within one or more sub-teams which make up the Oculus Project.

In joining the Oculus Project students collaborate with industry sponsors such as the Air Force Office of Scientific Research (AFOSR), Air Force Research Laboratory's Space Vehicles Directorate (AFRL/VS), and American Institute for Aeronautics and Astronautics (AIAA). Students also get the opportunity to work with industry sponsors such as Raytheon, SAIC, ABSL Space Products, Wind River, and AGI.

Zero Gravity Research

Each year a group of students applies for the opportunity to perform a research project in zero gravity on NASA's zero-gravity simulation aircraft, the C-9. This year the C-9 team is working with graduate student Jason Makela who is doing research on ion space propulsion. Recently, research has been focused on applying this technology to create regenerable emitter tips. Emitter tips, fabricated by coating sharp tungsten tips with molten indium, will be quenched in a vacuum in micro gravity, reproducing conditions in space. Creating the emitter tips in micro gravity will give Jason the opportunity to analyze the difference between emitter tips made on earth and in space, leading to a revolutionary new way to travel in space.



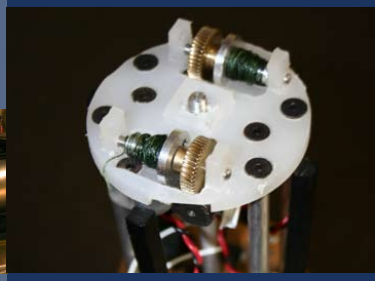
HAXS

The newest team in the Aerospace Enterprise, HAXS [High-Altitude eXperimentS) is a small team beginning to research cost effective high-altitude payload delivery methods.

Experimenting and developing hybrid rocket motors a primary focus of the experimentation will be cost reduction of casing, nozzle and propellant material and manufacturing. The final goal of the team is entry in the N-Prize competition, a challenge to launch an impossibly small satellite into orbit on a ludicrously small budget, for a pitifully small cash prize.

HAARP

An autonomous glider, the goal of the team is to study all aspects of the autonomous air vehicle system by designing and building a ground deployable vehicle capable of achieving level powered flight under 10,000 feet. The craft will have the ability to carry and support a 3 pound payload along wit being able to be carried by a singular person.



Cansat

Cansat is a university competition taking place annually in Amarillo, Texas. We design and build a cansat to be launched and deployed from a rocket at an altitude of about 760 meters. It descends no faster than 4.6 meters per second. If a parachute is the main recovery device, it must be released within 1 meter of the ground. Once landed, the cansat must be in its defined upright position or upright itself to its defined upright position. All operations must be autonomous and altitude data must be transmitted at least once every 5 seconds. The cansat must fit into the payload section of a 76mm diameter rocket.

Figure 4: Overall Aerospace Brochure

Graphic Design:

University Marketing

My work in University Marketing and Communications involved creating a number of documents with the same type of parameters. In most cases, a client would submit a primary "goal", or advertising genre—typical examples included advertising banners, posters, book covers, and campus logos. These goals had to be achieved in a short period of time and involved not only creating the final design but determining which design would be most cost effective and predicting how it would appear in final printing

As my time at University Marketing progressed I have been exposed to faster turn-arounds with projects and have had a greater understanding of what types of images define what Michigan Technological University is. By understanding how the University defines itself I have built a greater understanding on how to define myself and the other organizations and jobs I take part in.

Figure 5: Advertising Banner for Career Fair

Both of these poster examples were created as quite large public displays of their respective events. Both were created to be versatile enough to work for multiple years, with the Career Fair poster having a variable section that could be altered depending upon the date of each years fair.

Figure 6: Advertising Banner for Youth Programs

Figure 7: Word Art created for MTU letterhead

Figure 8: Diversity Talks Poster

These are two of my favorite examples of posters I've created at work. The Diversity poster created some discussion at work due to my use of swastikas combined with stars of David for the talk on the Holocaust. I stuck with the design because I believed the symbols were appropriate for the speech and would be eye-catching for the same reason that they were controverial.

The Nasa poster gave me the oppotunity to experiment with creating a star field in photoshop. Much of my work uses photography as a background but this was one of my first pieces that was entirely created in Photoshop.

Figure 9: NASA Grant Poster

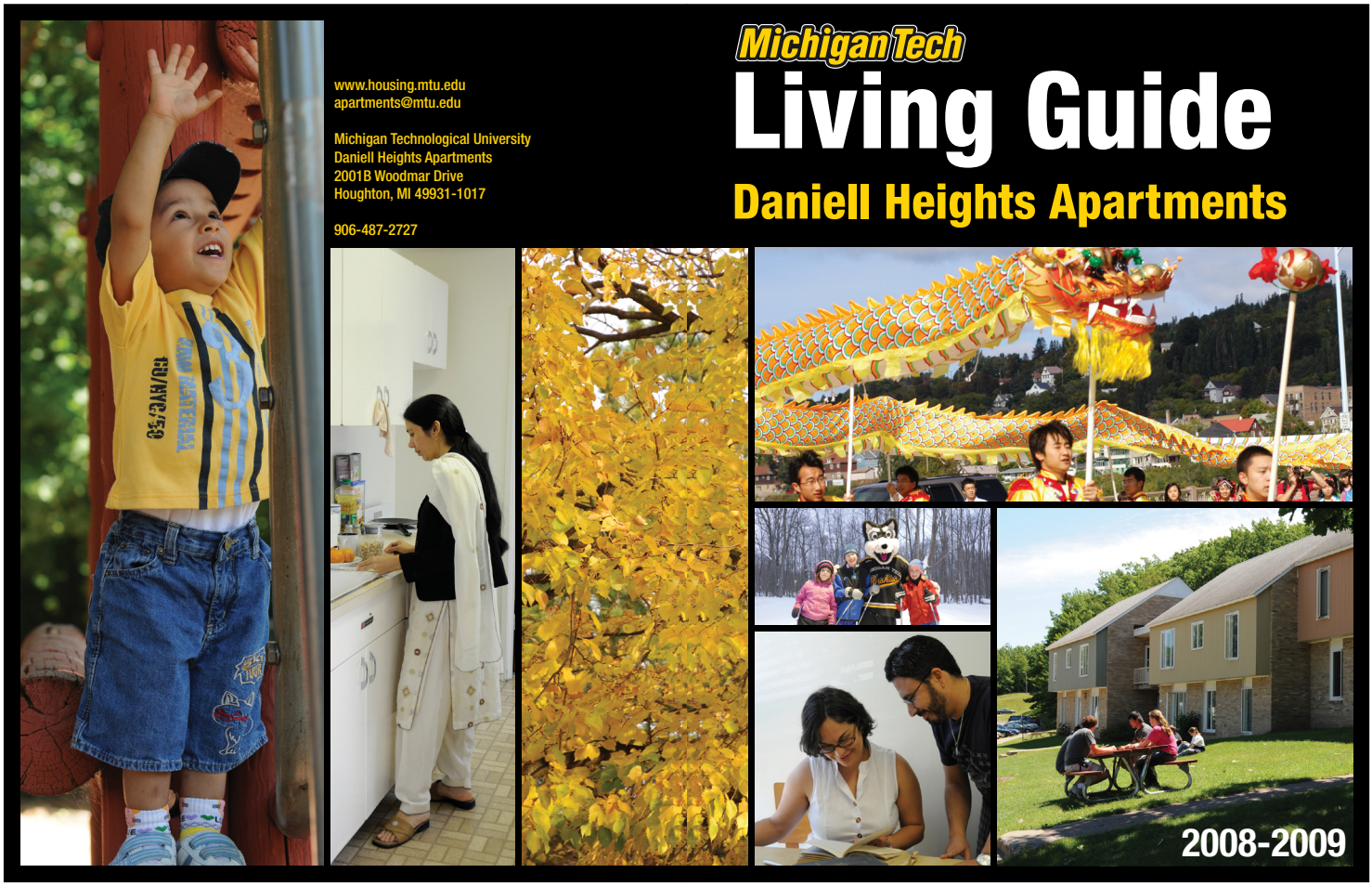


Figure 10: Daniell Heights Information Booklet Cover

Work at University Marketting has allowed me to see how a project can be altered when it comes around in a later season. I am currently remaking the Daniell Heights cover, following the similar theme of a combination of science themes and family photos.

The Logo depicted below will not be used for the Campus Cafe, but used a combination of photography, illustrator vector work, and selective typography to make an distinctive and simple logo.

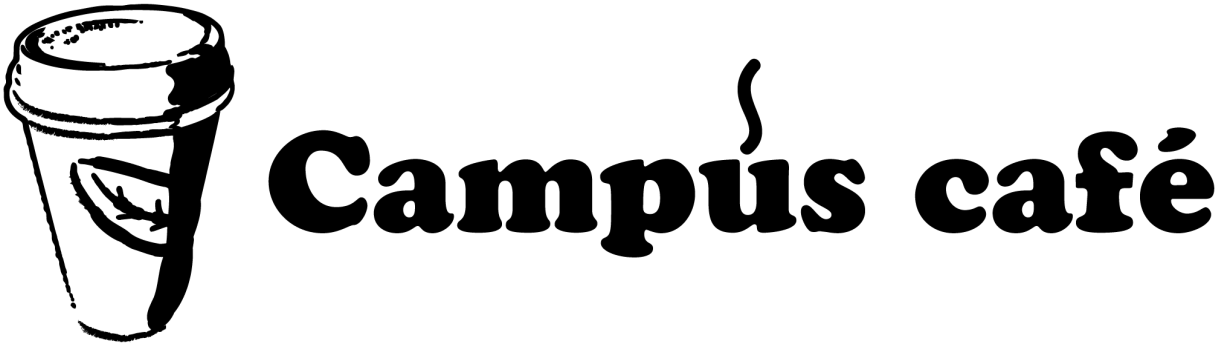


Figure 11: Possible Campus Cafe Logo Redesign

Photography:

Photography Work

My photography work started with the Introduction to Photography class taught by Brian Parmeter. Soon afterwards, with my purchase of a Canon XT SLR, I started taking photos for the Aerospace Enterprise and my own enjoyment.

These photos have become invaluable, being used in many different forms of media I've created and allowing me to further serve the Aerospace Enterprise as a whole. With the understanding I gained in Brian's class, I've been able to selective take shots that, regardless of their subjects, take such things as focus, perspective, textures, and overall layout into mind.

The following examples are some of my better shots and display various photography skills, which I go into further depth on each page.

Figure 12: Outside shot, capturing Michigan Tech imagery.

These were used in a Keweenaw Pride job fair activism campaign. Both were used and parallelled each other in their projects. The photos themselves used converging lines to draw interest, along with a purposefully sharp focus on the two 'couples'. These photos were meant to be very dinstinct displays of a combination of Michigan Tech imagery and proper looking 'couples'.

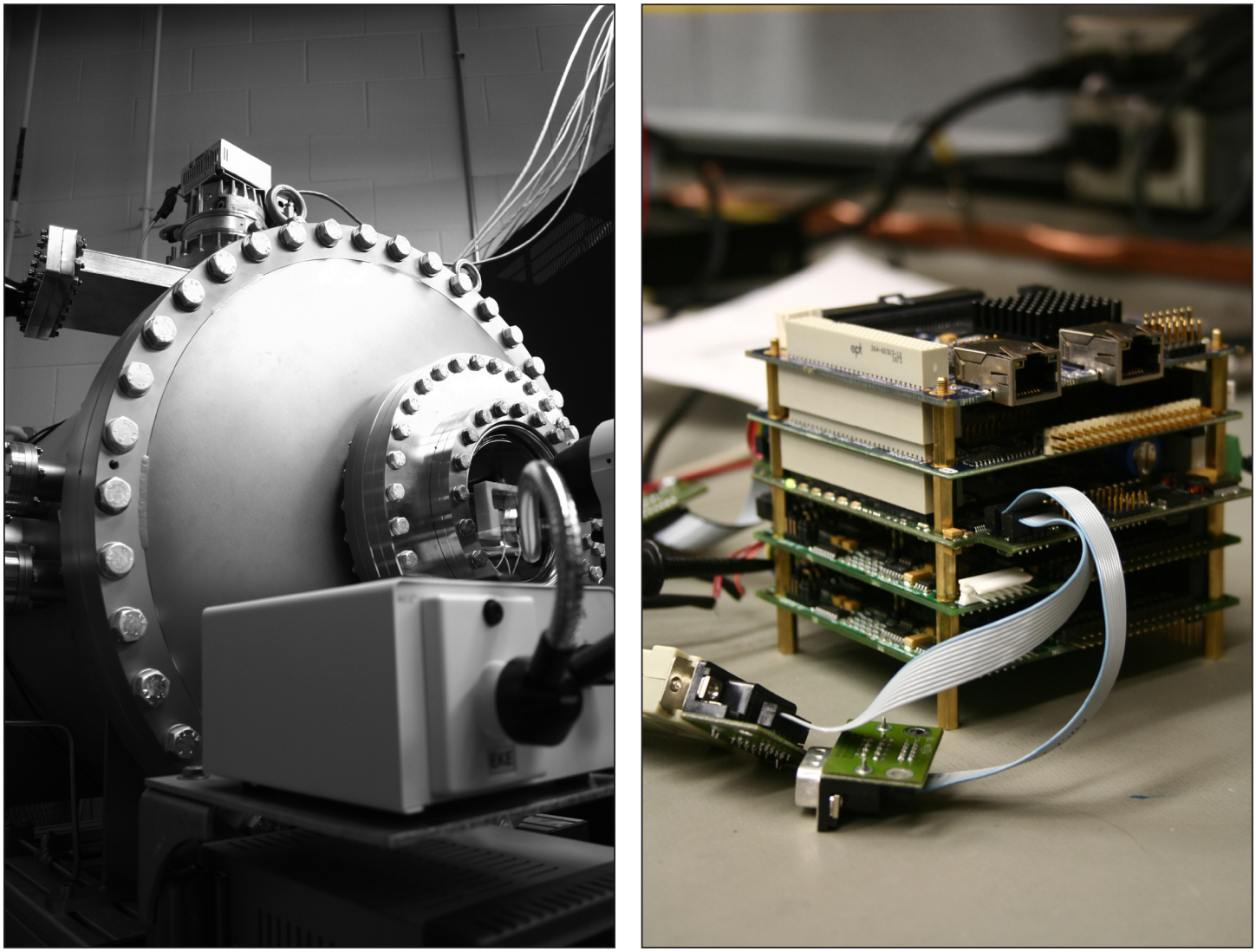


Figure 13: Aerospace Photography

Indoor shots with interesting use of perspective have been used repeatedly in the Aerospace Enterprise, to bring interest to objects that are static. Both images display simple lab equipment, but due to the distinctive contrast and difference in focus between foreground and background, the objects become more interesting.

Figure 14: Portrait Work

While most of my work has revolved around classes or student orgs, personal portrait shots have expanded my horizons and shown me the ways in which proper lighting can increase the potential of a scene. The second photo on this page was also one of my first experiences with 'lucky' photography, in which I received a very interesting illusion of size descrepancy.

The overall goal of these photos was to display how their subjects were very proper but also very fun.

Figure 15: Keweenaw Pride

Photography for Keweenaw Pride has ranged from the creation of shots as background components in posters, to extremely difficult shots involving low lighting and rapidly moving subjects.

While the second picture of a drag queen is mostly only useful for Drag Show advertisement posters, the experience taking pictures of the Queens has been invaluable. They are fast moving subjects and the events have a combination of low lighting and beam lights.

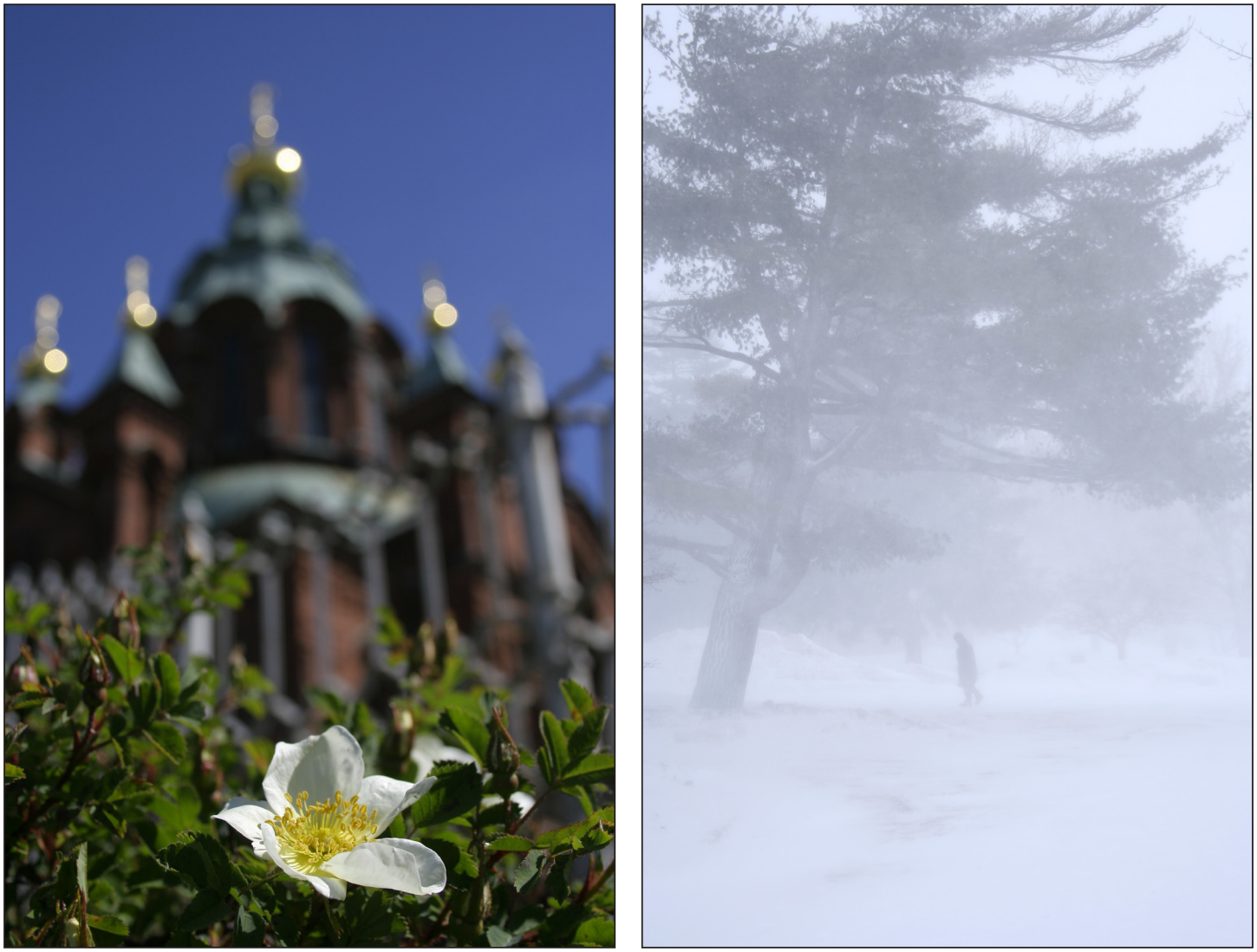


Figure 16: Personal Photography

In addition, personal photography has allowed me to explore the design aspects of objects around me, along with attempting treacherous shots in Michigan Tech weather.

My eventual goal with the second photo is to use it in a Michigan Tech postcard. While its primary subject, the EERC tree, does not become apparent right away, those who have lived at Michigan Tech recognize its imagery and can connect with it.

3D Modeling:

Unigraphics

As a Mechanical Engineer, many of my classes have involved 3D modeling. While 3D modeling has never been employed directly in any of my Scientific and Technical Communications courses, it has enhanced my understanding of design and its role in engineering. I am including some examples here to appeal to future prospective employers, and to demonstrate the capabilities I hold in this realm.

Many mechanical engineering projects depend on 3D modeling. Therefore my complementary experiences in design and Unigraphics should be relevant to future workplace projects.

While most of the pieces displayed here are not that complex, the lessons I've learned in my Scientific and Technical Communications courses apply to the creation of a 3D model. Concepts such as links in InDesign parallel how a Unigraphics assembly is created from multiple components.

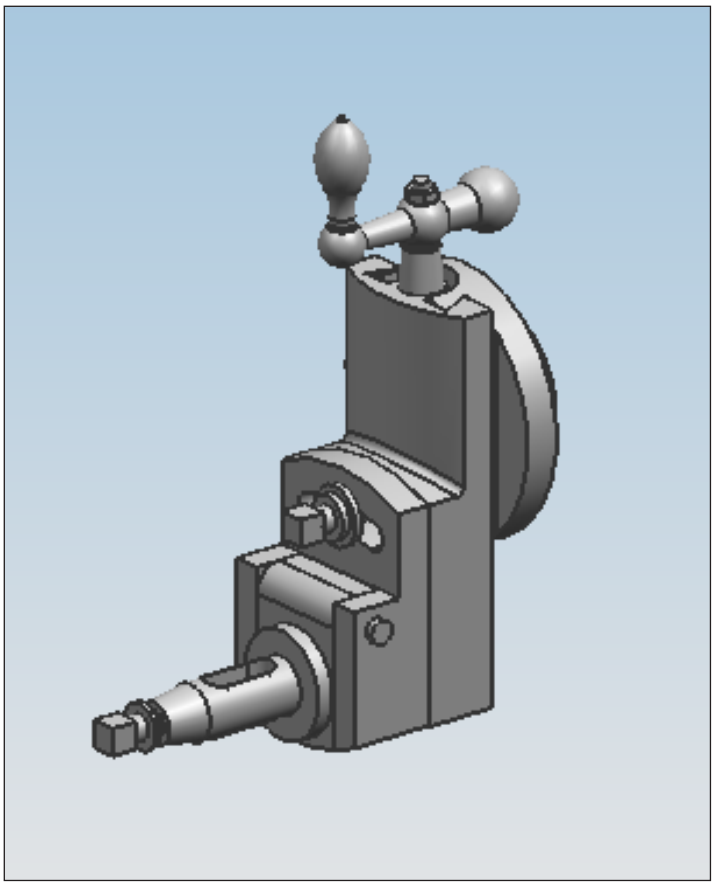


Figure 17: Assembly Example

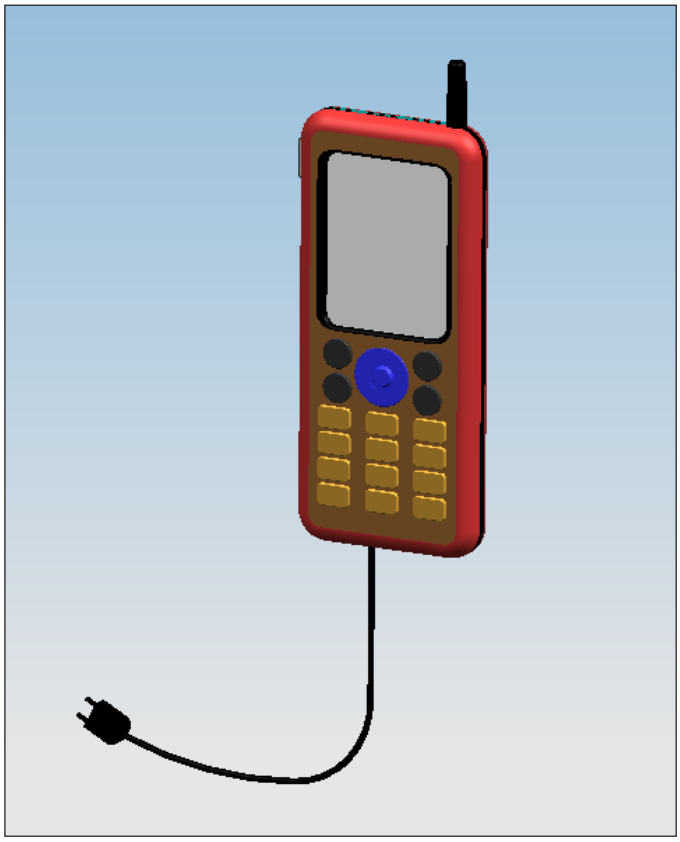


Figure 18: Simplified Cell Phone

Figure 19: Class Project in Product Creation