I spent the first term of my co-op working in the Antenna Mechanical department at Space Systems/Loral (SSL). SSL is the worlds’ leading provider in commercial satellites located in Palo Alto, CA. Their customers have included DirecTV, Sirius XM, Dish Network and many more. SSL works with both domestic and international clients. Although I am majoring in Materials Science and Engineering, I took a co-op position that I knew to be mostly Mechanical Engineering. One of the cool things about working in the Antenna department at SSL is that all of the reflector assembly is made in house. I had the opportunity to see the antenna reflector from an image on the computer screen to its final attachment to the spacecraft.

Following orientation on the first day of work, I was shown to my cube and given a book with everything I needed to know about Pro-E, a CAD program that is similar to SolidWorks, the program that is used at Cornell. I also was assigned a mentor who was extremely helpful throughout the entire co-op term. As soon as I was finished with the book, a week or so later, I was given my first task. I was to model and complete the drawing for a mechanical test sample to help analyze the backup structure of the reflector. While this job seemed stressful and really confusing at the time, it helped me understand how things worked with in my department. Seeing my test samples completed was all the satisfaction I needed to make those first confusing weeks worthwhile. Throughout the course of the co-op term, I helped to design several more mechanical test samples representing different joints in the backup-structure of the reflector. I learned a lot about the different properties of the composite materials through this process as well as the manufacturing that was necessary to fabricate my test samples. I even had the satisfaction of watching several mechanical tests completed.
I got to do and see a lot of cool things while on my co-op. I had the opportunity to complete the drawings for the tooling used to put the reflectors together. While tooling probably sounds lame to some people, it was literally like playing with Legos in CAD. I really enjoyed every minute of working on the tooling. It was a lot of fun; I don’t think I ever got over my Lego obsession as a kid. All jokes aside, these drawings gave me a great understanding of how the reflector is put together. I also got to see some of the work that went into creating different coverage areas for the satellite and work with data from the thermal distortion of the reflectors surfaces. A lot of my co-op experience was about seeing the little pieces and trying to understand how they fit into the bigger picture. With each new task, I had tons of questions and was directed from one person to another to get the answers. It was great talking to everyone and gaining the different perspectives that all went into the same design process.

The best part of my co-op had to be my trip to Los Angeles. SSL sends completed reflectors to Wyle where they undergo vibration and acoustic testing. They must meet certain requirements before being attached to the rest of the spacecraft. It was honestly awesome to see the reflectors being shaken at really high frequencies. We started out easy with a sub-reflector. While the sub-reflector was supposed to be the easy one, we actually had to write a non-conformance report and stop the test when the machine started making a funny noise. No harm was done to the sub reflector and the test was completed successfully once the issue was resolved. As great as it is when everything goes correctly, it is almost a greater learning experience when something doesn’t go exactly according to plan. I got to see a main reflector also undergo a vibration test. It was cool to see what the reflector could withstand. I really enjoyed the time I got to spend in LA as well as everything that I learned.

SSL provides housing for all of their co-ops. I was lucky enough to have two of my really good friends from school work at SSL with me for this term. One of them made a wonderful apartment mate and we spent a lot of time on the couch watching tons of movies and TV shows. With San Francisco so close by, we made several trips into the city via Caltrian to see the sites and do a lot of shopping. We
also visited both Stanford and Berkeley. I am a figure skater and was able to keep up with my skating on weekends. This area has a lot to offer and whatever you are looking to do or find you can find it. There were a total of nine co-ops working at SSL. Over the course of these eighteen weeks, we all got to know each other and grew to become a somewhat dysfunctional but totally loveable family. I know I have not said much about the time I spent outside of work and what I did for fun but I honestly loved almost every day that I went to work. Of course, there were highs and lows but this was an invaluable experience that I wouldn’t have changed anything.
Space Systems/Loral (SSL) is the world's leading producer of commercial satellites located in Palo Alto, CA. Their customers have included DirecTV, Sirius XM, Dish Network and many more. SSL works with both domestic and international clients. Coming back to SSL was much easier and also much more exciting than the first time around. I knew the people, I knew what was expected of me, and I had high expectations of my summer.

My position in Antenna Mechanical Design was the same as during my first term. I was still working with my real life Legos and improving on my drafting/Pro-E skills. I returned to the same mentor. While I still asked a lot of questions, the questions were more about the larger picture of where my drawing or tooling or modeling was going to effect the overall Antenna instead of simply how to turn on my computer, point, and click. All of the information I learned the first time around directly applied to this second time around. I am working up to the very last day designing a pull test to analyze the strength in a joint of the reflector. It is really exciting to help develop a test that is going to affect future designs. One of the cool things about coming back this summer was all of the stuff I had helped draft and the tooling I designed were in the process of being made. It was fantastic to see my designs come to life. This summer I also had the opportunity to learn some Non-destructive Inspection techniques. I was able to get my hands on some flight hardware. It was exciting to be able to handle hardware instead of simply seeing it on the computer screen.

This second time around, communicating with people and understanding the processes of the company was significantly easier. When I had a question I knew exactly who and how to ask. I had the wonderful benefit of sharing an office with another intern (who happens to also be from Cornell). Sharing an office made the time fly even faster than it did the first time around. We got to help each other and keep up an almost constant stream of banter back and forth. It was great to have a person to bounce my ideas of off. (most of the time we each ended up answering our own questions). Just being able to talk out loud without looking crazy was nice.

The really awesome thing about it being the summer was all of the other summer interns. It was great to meet and hang out with interns that came from all over the country. SSL has over seventy interns and co-ops from across the country. While SSL has a small
Ashley Harms-aah75  
Co-op Job Summary  
Space Systems/Loral- Term 2

contingency of Cornell interns and co-ops, there were tons of students from CalPoly as well as students from schools such as Boston University, Notre Dame, and Harvey Mudd. Our living situation was a little different this time around due to the amount of interns. It was much more exciting and interactive. We found ourselves going to pool parties, hosting barbeques, and hanging out more on a daily basis. The first term we mostly only ventured into the world on the weekends. We adventured to Point Reyes, Monterey Bay, as well as into San Francisco. While it is not necessary to have a car; it was much nicer this time around having access to multiple cars.

After completing the co-op, I would recommend the program to every incoming student at Cornell. It was a wonderful experience. I learned more practical skills than I would have ever learned in school. While summer internships are a great way to gain a little bit of experience, working 28+ weeks in a company allows you to grow into position and gain responsibility. I honestly could not have asked for anything else. I had a wonderful roommate for both terms as well as an awesome group of co-workers who imparted there wisdom on me. I had the opportunity to see something I worked on go from an image on a computer screen to something tangible being built in front of me. I really enjoyed the time I have spent at SSL.
Co-op Work Term Job Summary

A. Co-op Work Assignment

My co-op work assignment was in the Materials & Processes (M&P) group at Space Systems/Loral, a commercial satellite company, under Ron Yee. M&P qualifies new materials and processes and provides support for existing material- and process-related problems for every aspect of the production of Loral satellites. Thus, the organization works with every part of the company that deals with the production of the satellites.

The projects that I was assigned reflected the diversity of the work done by M&P engineers. I did not have one large, overarching project. Rather, I was assigned several smaller projects; some took a few days, while others took nearly my entire work term. The first project I was assigned was organizing data on radiation testing and combined environments testing done on different materials in the company. Over the years, various departments had subjected the materials they use to UV radiation, proton radiation, and electron radiation to see how they would hold up in solar radiation; often this testing was done in conjunction with thermal cycling to imitate space conditions. The project required me to ask various people throughout the company ask for old reports and data sheets in order to collect them all in one place. It familiarized me with the company’s structure while allowing me to learn more about environmental testing done on materials.

One of my other major projects was more design-related. The old process for holding waveguides that allow for the transmission of large amounts of RF waves within the satellite took too much labor and was inefficient because of the adhesive used and the general configuration of the waveguides and the clips and spacer blocks holding them apart. I worked on researching new materials for the setup and getting them tested and machined. I also had a continuous dialogue with design engineers about different ways to solve the problem.

One of the projects where I was the most independent involved mechanical testing of a type of composite uniax. I created the samples from pre-impregnated composite materials, laid up the samples and vacuum bagged them, got them machined, attached tabs to them for testing, and coordinated their testing.

Some other projects I worked on were researching and ordering new thermal interface materials and new materials for thermal blankets for various applications. In general, I ordered new materials and had them tested for compatibility with space requirements. I also helped prepare and test samples in the lab for various projects; I spent several hours a week in the lab and was able to see a lot of mechanical testing being done.

I did not have an assigned mentor but was generally assigned projects by three of the engineers in my department. I could approach any of them with questions and they were generally very helpful. During the first week, there was a good amount of reading about the department and its procedures. Throughout the co-op term, there were very helpful “New Hire Seminars” that exposed me to various parts of the company. Besides that, I looked up papers on my own to further my understanding of a topic I was working on.
B. Assessment of Learning and Development

Some of my Materials Science classes, especially MSE 2610 (Introduction to Mechanical Properties of Materials) and the polymers unit in MSE 3010 (Materials Chemistry), were extremely helpful for understanding what was going on. The co-op also taught me a lot about adhesives, composites, and other non-metals; I plan to take electives about these subjects in the future, so the co-op fit right into my curriculum. Most of the knowledge required did not require too much expertise or mathematical knowledge. I found having familiarity with mechanical properties of materials was much more useful. Working at Loral also has given me exposure to the aerospace industry, with which I had had very little interaction, and the special needs of products that are sent out thousands of miles into space.

This is my first real full-time job in engineering, so I learned a lot about corporate engineering culture. Despite its location in Silicon Valley, Loral seemed much more like a traditional engineering company where each engineer has his/her own specialty, most have been with the company for at least several years, and almost all have extended experience working in the aerospace industry.

I learned a lot about how to develop and maintain professional relationships with people inside and outside my department. My job often required me to pick up the phone to ask someone at a different company for a sample of their material, so I gained a lot of confidence talking on the phone to people I did not know. I also learned to proactively ask questions and inquire about work. I would probably have started this earlier if I could do this over again.

C. Life Outside of Co-op

Loral provided free housing for all the co-ops at a corporate housing apartment complex near Downtown Mountain View, an area with lots of places to eat and hang out. They also provided a shuttle service from the Caltrain station (0.25 miles from the apartment complex) to work. I bought a bike my first week and often commuted by bike; Loral is only about 3 miles away from the housing. It would have been nice had one of the co-ops had a car, but we made do, and public transportation was extremely accessible. The 8 of us at the apartment complex got to know each other pretty well and hung out on weekends, sometimes barbecuing by the pool or taking trips to San Francisco and other nearby parts of Northern California.

Some of the co-ops played soccer and volleyball with co-workers after work. There are also opportunities for volunteer work in the area; I found a volunteer position doing IT support work for a non-profit in San Francisco. In general, I found Northern California to be a great place to live, and Loral’s housing is unbeatable. Stanford is also very close, so if you have friends there, it’s very easy to meet up with them.

D. Evaluation

Spending a semester in Northern California is amazing after spending four in Ithaca. It doesn’t snow here! The housing and all the amenities are great. It was really great exposure to an engineering work environment for me, and the work taught me a lot about spacecraft materials and mechanical properties of materials, specifically adhesives, polymers, and composite materials. I learned how to work in a corporate environment and develop professional relationships with my coworkers.

E. Additional Info

Feel free to contact me with any co-op or Loral-related questions! My email address is pi37@cornell.edu.
Co-op Work Term Job Summary

A. Co-op Work Assignment

My co-op work assignment was in the Materials & Processes (M&P) group at Space Systems/Loral, a commercial satellite company, under Ron Yee. M&P qualifies new materials and processes and provides support for existing material- and process-related problems for every aspect of the production of Loral satellites. Thus, the organization works with every part of the company that deals with the production of the satellites.

My second co-op term was very short, because, during the spring semester, I participated in a study abroad program that ended in late June. I made arrangements in the fall with both Loral and the co-op office, and I did not face any significant difficulties. I was, however, unable to work on projects as large as the ones I worked on during my first co-op term. One of the best parts of the second co-op term was being able to hit the ground running, starting to work on real projects almost immediately after arrival; because of this, I was able to do about as much work as a typical first-time summer intern despite the short work term.

The projects that I was assigned reflected the diversity of the work done by M&P engineers. Unlike during my first term, I did have a large overarching project. It involved writing a report on how a new technology that Loral is implementing will affect the materials on the satellite. After conducting a thorough literature search, I spoke to many engineers throughout the company about the details of the new technology and its ramifications. I completed and submitted the report, which will now be used by the M&P group when the new technology is used for future satellites.

I also worked on a project testing a new type of coating for SS/L parts. I conducted various tests, including a tape test, a liquid nitrogen dunk, and cross-sectional microscopy. I also helped to compile data from hundreds of documents in one database, condense and process it in Excel using Visual Basic, and finally create a new database to make the information much more accessible. Finally, I helped bond and test strain gauges on a critical test part.

As in the fall, I did not have an assigned mentor but was generally assigned projects by a few of the engineers in my department. I could approach any of them with questions and they were generally very helpful. In addition, I looked up papers on my own to further my understanding of a topic I was working on. I was generally already accustomed to the company, and did not have any difficulty resuming work.

This summer, I began going to weekly lunch brainstorm meetings, where a group of young engineers discusses a chosen engineering or company-related issue and brainstorms novel solutions to these problems. These meetings really helped me understand better how Loral satellites operate. They also showed me a very co-operative, interdisciplinary approach to problem-solving that I hope to use in the future.

B. Assessment of Learning and Development

As during my first term, several of my Materials Science classes, especially MSE 2610 (Introduction to Mechanical Properties of Materials) and the polymers unit in MSE 3010 (Materials Chemistry), were
extremely helpful for understanding my work at Loral. However, most of the background knowledge that I used during my second term, especially about adhesives, composites, and other non-metals, was gained during my first term. Because I was studying abroad, I could not take electives about these subjects in between my terms, but I plan to do so in the future, so the knowledge I gained at Loral will complement my curriculum very well. Most of the knowledge required did not require too much expertise or mathematical knowledge. I found having familiarity with mechanical properties of materials was much more useful. Working at Loral also has given me exposure to the aerospace industry, with which I had had very little interaction, and the special needs of products that are sent out thousands of miles into space.

This being my first real full-time engineering job, I learned a lot about corporate engineering culture. Despite its location in Silicon Valley, Loral feels much more like a traditional engineering company where each engineer has his/her own specialty, most have been with the company for at least several years, and almost all have extended experience working in the aerospace industry.

I learned a lot about how to develop and maintain professional relationships with people inside and outside my department. My job often required me to pick up the phone to ask someone in a different department whom I had never met for information, so I gained a lot of confidence talking on the phone to people I did not know. I also learned to proactively ask questions and inquire about work.

C. Life Outside of Co-op

Loral provided free housing for all the co-ops at a corporate housing apartment complex in Santa Clara. There were quite a few co-ops and interns at the complex, and there was a pool and a gym. Unlike in the fall, I shared a room with another intern; the location was also a bit farther from work. However, several of the interns had cars, so we carpooled to work. Loral also provided a shuttle service from the Mountain View Caltrain station to and from work, but taking this required buying a train ticket from Santa Clara.

Some of the co-ops played soccer and volleyball with co-workers after work. In general, I found Northern California to be a great place to live, and Loral’s housing is unbeatable. Stanford is also very close, so if you have friends there, it’s very easy to meet up with them. I also used this summer to travel around California using Greyhound and Southwest. I went to Yosemite National Park, San Francisco, Berkeley, Los Angeles, and San Diego. The apartment complex’s location right next to San Jose International Airport facilitated travel.

D. Evaluation

Northern California is a wonderful place to spend the summer. The housing and all the amenities are great. It was really great exposure to an engineering work environment for me, and the work taught me a lot about spacecraft materials and mechanical properties of materials, specifically adhesives, polymers, and composite materials. I learned how to work in a corporate environment and develop professional relationships with my coworkers. I really appreciated having this second co-op term to re-integrate myself into the M&P department and into Loral in general.

E. Additional Info

Feel free to contact me with any co-op or Loral-related questions! My email address is pi37@cornell.edu.
Space Systems/Loral Job Summary

I spent my first semester of junior year working at Space Systems/Loral in the Solar Array/Mechanisms department. Located in Palo Alto, CA, Space Systems/Loral is an aerospace company that constructs, deploys, and maintains commercial satellites for companies like DirecTV, Dish Network, and Sirius XM. Even though I am studying Materials Science and Engineering at Cornell, I worked as a Mechanical Engineer, yet I had the unique opportunity to learn more about solar cells. Since the solar array provides most of the power used to run the satellite, there are constantly new initiatives to find a more efficient cell, to ensure there are no defects on the cells, and to increase the power capacity by increasing the amount of solar panels.

When I first entered Space Systems/Loral in August, I was given a book to browse through; I was given my first assignment to figure out how a material change would impact the current models; and I met my mentor, who not only answered my questions but also never hesitated to teach me more about the solar array. Over the course of the semester, I had one major project, to qualify a material change. Since the material the company was using previously was too expensive and had too high of a lead time, it was important to switch to a cheaper material while maintaining the characteristics, such as a small coefficient of thermal expansion and strength of the older material. The qualification of the material involved creating a risk mitigation coupon, writing a risk mitigation coupon test procedure, correcting the procedures that referenced the old materials, and finally creating a test set up that would appropriately test the coupon and other pieces that were affected by the material change. Initially, I thought that I would only be working on documentation, but quickly I found out that I had to design the coupon and the test set up primarily by myself. Even though I asked my coworkers questions, I had to learn how to CAD with ProE by myself because everyone was busy with their own projects. At first, I made a few fundamental design errors, but my mentor helped me fix them quickly. The first test set up that I created must have taken me at least a two to three weeks; the second test set up on the other hand ended up taking me about two days.

My boss and I met on a weekly basis, which helped me understand his expectations for me. He always made sure that I was being challenged with work and tried to incorporate what I learned in school with projects that he assigned to me. Of course, he thought that Materials Science literally dealt with picking a particular material and qualifying it, but he soon realized that I could help with a lot of pet projects. I became involved not only with the qualification, but also with how the solar array deploys, research and development project, 3D modeling, and a database that tracked the incoming and outgoing drawings. I witnessed new, innovative techniques that are used in the work force including thermography, which sends a heat wave through the solar array and detects delaminations. Recently, I saw the solar array pass through a vibe test. High speed cameras documented the movement of the hold downs, which are used to deploy the solar array.

Even though a project may be assigned to a particular person, it doesn’t mean that the project needs to be completed independently. I was lucky enough to have an officemate who was pretty savvy in VBA excel code, who helped me write a macro for a database that I created. On the other hand, she and I worked together to find an equation of the line. By constantly being thrown onto different projects, I
realized that there is always something to learn, and I won’t ever know everything no matter how long I am at Space Systems/Loral. Don’t shy away from not knowing what to do. School won’t ever completely prepare you with the appropriate models or equations, but it does teach you how to learn. Countless numbers of times, my coworkers and I cracked open a Johnston and Beer book. Just ask questions!

Unlike all the other co-ops at Space Systems/Loral, I didn’t live at Oakwood, the company leased apartments. Because I am from the area, I ended up living from home and driving to and from home. At first, I was a bit bummed that I lived at home because I didn’t get to make as close friendships with the other co-op students. It wasn’t long until I met with one of the co-ops, who happens to be one of my closest friends from Cornell, for lunch almost every day. I, then, also started going over to the co-ops’ apartments about once a month. Because I lived from home, I drove to work everyday, and because traffic was a nightmare, it ended up taking me 45 minutes to get to work and approximately an hour to get home from work. I learned how to control my road rage and started learning to bob my head to the music. Saying all of this, it was nice to have a car because I was able to get to work when I wanted to, and I could leave work when I wanted to without needing to rely on someone else. There were plenty of days that I would get into work at 8:45 a.m. and leave at around 6:00 p.m. Since I went to highschool merely fifteen minutes away from where I worked, I had a lot of friends that attended colleges around Palo Alto at Stanford, Cal Poly San Luis Obispo, UC Berkeley, USC, and the list goes on. It made it easier for me to visit a lot of my friends during this semester because I had no homework over the weekends. And since worked ended at around 5 or 6 p.m., I joined a yoga class and went to the gym on a regular basis. I simply had more time to focus on things that I loved without the stress of homework or midterms.

When I initially joined the co-op program, I wasn’t sure that I wanted to actually take a semester off of Cornell. I thought about how much I would miss my friends and just miss being on my own, but after taking this opportunity at Space Systems/Loral, I made new friends, and I still had the chance to see people when I wanted to. I am even much more confident to take a job at any company. Of course at times, your coworkers still view you as young people (because I am younger than everyone in my department), but they also congratulate and recognize you for the work that you do complete over the semester. I am so happy that I had a chance to take a break from the high stress at Cornell, sleep seven to eight hours on a daily basis, and of course get paid.
Space Systems/Loral Job Summary

The summer before my senior year of college, I completed by co-op by interning at Space Systems/Loral in the Solar Array Mechanical department. Located in Palo Alto, CA, Space Systems/Loral is an aerospace company that constructs, deploys, and maintains commercial satellites for companies like Direct TV, Dish Network, and Sirius XM. I returned to Loral as a Mechanical Engineer, but this time, I had the unique opportunity to take on more responsibility with my projects.

When I first entered Space Systems/Loral in August 2011, I was given material that I was supposed to qualify so that it could be used on a spacecraft. I had to learn what the basic lingo of Loral was. I had to understand that when people would say “mils” it meant thousandths or what “nominal” even meant. I am pretty sure that at Loral “mils” and “nominal” are used in every other sentence. Although I never actually tested anything, I was able to design one test fixture, while doing analysis on the rest. The qualification of the material involved creating a risk mitigation coupon, writing a risk mitigation coupon test procedure, correcting the procedures that referenced the old materials, and finally creating a test set up that would appropriately test the coupon and other pieces that were affected by the material change.

When I came back to Space Systems/Loral in May 2012, I was put back on the same project that I was put on last fall. The material change had still not been completely qualified, but the risk mitigation coupon had been tested, and thankfully, it succeeded! However, this risk mitigation coupon was only a minor dent in what needed to be done. I had to fix the procedures, test the actual part that would be used in space, and make sure that everything was built to spec. Before, I had 20 weeks to create a test fixture, but this past summer, I only had ten weeks to test three different parts and run a few tests. My boss had told me the first day that I walked in that I would bear a lot more responsibility and have to do things independently. One time, I even came in at 6 a.m. on a Saturday morning to ensure that one of the tests that I was helping a senior engineer in would be completed in a timely manner. I had to explain to the techs what needed to be done, and the technicians respected me enough to call me at six in the morning if they needed help. I wrote memos and dealt with the planner to ensure that work orders were created. Ultimately, I enjoyed this session significantly more than the first co-op session because I felt more like a full-time employee even though I still asked my mentor multiple questions and ran what I did by him to double check my work. I had an easier grasp understanding what was needed from me exactly; hence, I was a lot more proficient with my work.

I lived at home again this summer, but it was really different. In the fall, there were nine Cornell co-ops and not many other people as young as us around. But during the summer, there were over seventy interns from around the country all in different universities. It was so amazing to meet all these different people, and we constantly planned to do something every week. For example, there were about ten to twelve people that met up on Fridays after work and had dinner. We watched movies, ate gelato, and even started taking a Bollywood cardio class that met every Thursday. Because it was summer, it just seemed like it was so much easier to hang out and get to know one another. Also, at least one person in every room of four (plus me who lived at home) had a car, so it was significantly
easier to get to places this time. We weren’t limited to just the Oakwood or Mountain View especially since the co-ops didn’t live in the same place they lived in last year or together in fact.

When I initially joined the co-op program, I wasn’t sure that I wanted to actually take a semester off of Cornell. I thought about how much I would miss my friends and just miss being on my own, but after taking this opportunity at Space Systems/Loral, I made new friends, and I still had the chance to see people when I wanted to. I am even much more confident to take a job at any company. Of course at times, your coworkers still view you as young people (because I am younger than everyone in my department), but they also congratulate and recognize you for the work that you do complete over the semester. I am so happy that I had a chance to take a break from the high stress at Cornell, sleep seven to eight hours on a daily basis, and of course get paid.
In the fall semester of 2011, instead of being a college student I was given the opportunity to experience the workforce. During my first co-op term I worked for Space Systems/Loral under the Mechanical Systems department of the organization. Space Systems/Loral designs and builds satellites and space systems for a wide variety of government and commercial customers. Its products include high-powered direct-to-home broadcast satellites, commercial weather satellites, and digital audio radio satellites.

During my initial weeks at work, I was given the task to create a master block diagram of a specific satellite. Although I did not finish the task, it taught me numerous spacecraft terminology and gave me a feel of how the subsystems in a satellite are connected to one another. Additionally, the New Hiring Seminars that the company provided allowed me to obtain an understanding of not only the department I worked in, but the work and the required teamwork other divisions of the company must undertake in order to successfully produce a satellite.

The main assignment that I was given to work on however, revolved around MATLAB. The task that was given was to create an Acoustics Vibration Database. The Acoustic Vibration Database (AVD) was a MATLAB tool that could be used to obtain vibration test data from satellite-level acoustic test results and compare it to previous programs. The tool has a graphical user interface (GUI) which allows the user to search through three unique criteria: program, the accelerometer’s plane orientation, and the accelerometer’s location. After selecting the criteria desired, the user must simply update the database and the GUI will update the database to only contain the accelerometer data that meets the criterion. Once doing so, the user has the ability to plot the power spectral density data of the remaining units, highlight a specific program (if more than one program was chosen), compare the power spectral density data to a desired specification, and display a list and/or details of the remaining accelerometers. If not satisfied with the format or all of the data included in the search, the user can save the remaining data in an MS Excel document or in a CSV file to do whatever he or she chooses. The user also has the ability to upload new data into the database from a new program, edit the data already in the database and reload the most current, complete database.

Additionally, I was working on creating two other GUIs on MATLAB, one that allowed the user to observe how a specific component would fare on a certain spacecraft flight and the other one focused more on allowing the user to see how the specification for different parts of a satellite differed from one another. The three GUIs would ultimately allow the user to determine if a specific accelerometer was being over tested and if the unit would survive the shock induced during launch. Furthermore, from time to time I helped some of my co-workers analyze shock data and was given the opportunity to witness up close and personal the tests that were conducted on the satellites.
During the summer of 2012, I returned to Space Systems/Loral to complete the co-op program. I worked in the Spacecraft Systems Engineering organization as a Mechanical Systems Engineer. Space Systems/Loral designs and builds satellites and space systems for a wide variety of government and commercial customers such as DirecTV, Sirius XM Radio, and Dish Network. Its products include high-powered direct-to-home broadcast satellites, commercial weather satellites, and digital audio radio satellites. The company is located in Palo Alto, California.

As a system engineer, your focus is on how complex engineering projects should be designed and managed over their life cycles. At SS/L system engineers are responsible for integrating all the subsystems of the satellite while ensuring all of the customer’s needs and requirements are met. During my initial weeks at work, the main tasks I focused on was updating the MATLAB tools I had created during the first co-op term in order for them to have a greater functionality and take into account more recent data. The first thing on the list was updating and adding a final feature to the Acoustic Vibration Database (AVD) that was created on MATLAB. The AVD was a MATLAB tool that could be used to obtain vibration test data from satellite-level acoustic test results and compare it to previous programs. The tool has a graphical user interface (GUI) which allows the user to search through three unique criteria: program, the accelerometer’s plane orientation, and the accelerometer’s location. After selecting the criteria desired, the user must simply update the database and the GUI will update the database to only contain the accelerometer data that meets the criterion. Once doing so, the user has the ability to plot the power spectral density data of the remaining units, highlight a specific program (if more than one program was chosen), compare the power spectral density data to a desired specification, and display a list and/or details of the remaining accelerometers. If not satisfied with the format or all of the data included in the search, the user can save the remaining data in an MS Excel document or in a CSV file to do whatever he or she chooses. The user also has the ability to upload new data into the database from a new program, edit the data already in the database and reload the most current, complete database.

Additionally, I updated two other GUIs on MATLAB, one that allowed the user to observe how a specific component would fare on a certain spacecraft flight and the other one focused more on allowing the user to see how the specification for different parts of a satellite differed from one another. Aside from upgrading the GUIs I previously created during the first term, I created another GUI that compared random vibration qualification test data on a unit to the requirement. Ultimately, these GUIs would allow the user to determine if a specific accelerometer was being over tested and if the unit would survive the shock induced during launch. Also, from time to time I would assist a couple of co-workers analyze shock data.

Outside of work, I also had a positive experience. Being the summer, SS/L hired numerous interns and placed some of us in the same living complex. Even though the company’s living arrangements separated some co-ops and interns, we were still able to meet and establish
Daniel Moskowitz
dm488
Electrical and Computer Engineering
Space Systems/LORAL, Fall 2011

The department I was assigned to at Space Systems/LORAL is responsible for designing and building the passive filters for our satellites. When signals are received by the antennae, they need to be separated into their specific channels, filtered, and strengthened. My group is at least partially responsible for those functions. We handle the modification of heritage equipment – in some cases the design of filters with entirely new specifications. When the order comes through, we follow this project from that initial planning stage through building, testing, and eventual delivery to the technicians who install it into the final satellite build.

As for my efforts, I was shifted from one focus to the next depending on my department’s priorities and on my own working skillset at the time. When I first started, I helped revise old test procedure documentation. This was a hands-off task, but it was highly research-intensive and forced me not only to learn a sizable amount of technical information but also to interface consistently with my coworkers. When I had come far enough along in my knowledge of the department, I was given increasingly important duties. Halfway through my term marked the beginning of my lab experiences, but they were still sprinkled between bouts of paperwork and PowerPoint. The hands-on jobs became more frequent, however, until my last day of the term where I am still tweaking a difficult filter at my lab bench. This staggered approach to my training was more efficient than having me mindlessly memorizing manuals. Now that I am leaving, I know I understand more than I did coming into the job. Most of my assignments came from my direct supervisor, though I approached my coworkers on slow days when I knew they had projects that could use a little extra muscle.

I don’t believe much of the technical knowledge I brought from Cornell helped on the job. As an electrical engineer, certain terms and background theory is of course applicable. Knowing how filters
work – especially how to characterize them in technical terms – certainly helped me pick up the material faster. But that’s just it; most of what I needed to know could not have been taught in school, where the focus is on theoretical rather than practical knowledge. Did my employers expect me to know certain things? Absolutely not – they did not presume any prior knowledge, which was comforting. Did my Cornell background and sharpened engineering mindset help me pick up what I needed as fast as I could? I can honestly answer, “Yes.” I also learned that interpersonal skills are more important than any small pocket of knowledge a person can possess. The nature of modern engineering is such that there are too many facts and skills for any single individual to keep track of by himself. While knowledge is always important, it is encouraged for employees with problems to seek out those who can help them rather than allowing them to suffer in silence and hurt the company’s productivity.

One aspect of my employment that I appreciated the most was SS/L’s investment in our comfort. I didn’t need to look for housing; they provided it for us. The accommodations were outstanding. I’m going to really miss my kind-sized bed, the Jacuzzi, the stocked kitchen, and the always-empty laundry rooms. They also provided free shuttle service to the office from the train station – a mere ten-minute walk from our rooms. There is free service back to the station after work, as well. And because SS/L has a sprawling campus, there is an on-demand shuttle that takes employees from building to building. Transportation at work was never a problem. In the greater California area, transportation is more expensive but only slightly less convenient. The Caltrain was a clean, welcome break from the NYC rail system. Buses are everywhere and provide long transfer times to make public transit more affordable. There is a smaller rail system in San Francisco itself, as well as ferries, trollies, and an in-construction subway system. When I first arrived to the area, I was blown away by the sheer amount of options available. A car would have been more convenient, but it was certainly not a necessity.

Finding things to do on the weekend was never a problem for me due to the large number of co-op students in the area (80% of whom worked at SS/L and lived in the same apartment complex as I did).
The city of San Francisco has much to offer, and I found it a very relaxed and welcoming city in general. The company also offers clubs and athletics; though I never participated myself, a few of my friends have played soccer, basketball, and volleyball with their coworkers.

The best feature of my job was how easy-going everyone was even though they took their work very seriously. Within the first few weeks of my employment, I noticed that although there are many young people as a result of the company’s recent aggressive expansion, the overwhelming majority of employees are older engineers who have been here five, ten, fifteen, twenty or more years. The fact that anybody can have such commitment to their job speaks volumes about the kind of environment that is fostered here. On the other hand, the job was not without its faults. After my time in company housing, I simply can’t sleep on my tiny twin bed anymore.
This summer, I completed my second term at Space Systems / LORAL. I returned to the same group as last time, which is responsible for designing passive filters. As you can imagine, this is an important function in the company – without these parts, which require a good deal of specialized know-how to manufacture, the satellite would be rendered merely an expensive floating box!

Last fall, I was given tasks to slowly introduce myself to this highly technical process. Sure enough, I was quickly brought up to speed the moment I sat at my desk in May and was put to more important work. That’s not to say the training stopped – here at SS/L, “learning” is an ongoing process for everyone. There are new technological advancements to give our company the competitive edge, and there are always new opportunities for professional improvement within the organization – suffice to say, there is no shortage of ways to indulge oneself in learning.

I found this to be especially true for myself during my second term, as my involvement became less singularly focused on building filters and more spread across many areas. I began where I left off – working on various projects at my lab desk, building filters for testing and for delivery to internal groups that needed them. Towards the middle of my term, I found myself slowly pulled away from those jobs and towards more high-level tasks, such as working on customer data packages and testing procedures. I found that my training never stopped – it just became less obvious. There was a paradigm shift from “training for training’s sake” to “learning for the task at hand.” Even during this last week, I am picking up new knowledge about the technology and the organization of SS/L.
Much of this knowledge is in areas I would not have imagined delving into. I did not pick up the required technical skills from Cornell – besides one required ECE class, Electromagnetic Fields and Waves, the first few years in this major are RF-light. That didn’t matter. What was more important was the work ethic I picked up from Cornell, as well as learning-how-to-learn. This isn’t a field I thought I could go into, but now that I’ve explored it, I have found an interest that I didn’t think was possible. From talking to my coworkers, I’ve seen that this is the norm for this field. I have met and worked beside many highly respected engineers and business people during my short stay here. Their career paths are diverse and inspirational – it is easy to lose sight of all the possible ways your career can unfold when you’re constantly surrounded by students. If there is one thing I have heard about how SS/L’s customers see us, it is that they don’t see a black box “company” – they see a collection of skilled, trustworthy people. Being able to work beside these people and learn from them is among the experiences here for which I am most grateful.

I am also grateful for the HR staff that was assigned to help us settle in at SS/L. Their interns are provided housing in an amazing resort-like apartment complex. This removed all the anxiety from having to search for a place to live – and because they group intern housing together, there were always other people around my age to hang out with, some of whom I became quite close to. We were lucky enough that many of us had cars, allowing us easy transportation to work, from work, and around the area. SS/L does provide free shuttle service from the main transportation hub, though, which I took every day last year.

All things considered, this was a fantastic experience and probably the best decision I’ve made since coming to Cornell. One might ask, “How is this different than securing two summer internships?” The answer is that it is the entire package of Co-op that places it far and above individual internships: the devotion of the staff at Cornell, of the managers who took us under their wing, and of the HR personnel who tried their hardest to provide a seamless transition to the workforce.
Varun Natraj (vrn3)
Mechanical Engineering
Space Systems/Loral
Fall 2011

Term 1 Job Summary

Space Systems Loral is a commercial satellite company located in Palo Alto, California. They primarily manufacture communications satellites. Some of their most well-known customers are Dish Network, DirecTV, and Sirius XM Radio. They also manufacture satellites for numerous international companies.

I worked in the Subsystems Structural Analysis and Test group. The main function of this group is to perform all the structural analysis for subsystems within the bus of the satellite. The bus is the main body of the satellite and houses all of the electronics of the satellite, the heat pipe and propulsion systems, and supports the solar panels. The group I worked in is responsible for the structural analysis of all of these systems along with vibration and acoustic testing of these components and larger scale spacecraft vibration tests. Additionally, whenever there are any structural issues on a satellite my group is often responsible for figuring out the problem and coming up with a solution.

My first assignment as a coop was to compile analysis data on solar arrays from various past programs and organize them into a database to use as a reference to check any future analysis. Almost all of my other work as a coop was with Finite Element Analysis software, as nearly all of Loral’s structural analysis is done using Finite Element Analysis. As an intro to this software, my boss gave me a project to perform the dynamic and static analysis on a few small brackets. I learned to use PATRAN and FEMAP for pre and post processing and used NASTRAN to actually run the analysis. Once I had learned enough of the software I was able to complete multiple analysis packages, one for a support structure and the other for a cooling system, that were used on current spacecraft programs set to launch next year. For both of these packages I was able to complete my analysis, suggest changes to the design and then finalize the analysis before the parts were sent to be machined and installed on the satellite. If I ran into any problems with my analysis there were always numerous analysts from my group ready to help.

Working through all of the analysis projects has made me relatively proficient at using both FEMAP and PATRAN, and creating bulk data files to use with NASTRAN. FEMAP, PATRAN, and NASTRAN are FEM software packages commonly used in the aerospace industry. In addition to learning how to use all of the software, I also helped design a test, got to see a tour of the Hi-Bay (where the satellites are assembled), and got a tour of one of the reflector manufacturing facilities. Content from ENGRD 2020, MAE 2120, MAE 3250, and MAE 3260 related to the analysis I did. The stress analysis focused on Von Mises Stress and Safety Factors, while the dynamic analysis focused on natural frequencies.

My work experience during this coop term was fantastic, but I would argue that the accommodations that Loral provided us (there were a total of nine co-ops from Cornell at Space Systems) made the experience even better. In addition to our pay we were provided housing and full benefits. We were given housing at a corporate housing apartment complex in Mountain View, CA. It’s only a short walk
from the Cal Train station, grocery store, and downtown Mountain View. Downtown Mountain View is a really nice area, there are tons of restaurants and with the Cal Train so close, it’s really easy to get to San Francisco, San Jose, or Stanford. We were able to go to San Francisco on multiple occasions and I had the chance to make it to UC Berkeley to visit a friend there as well. I was also able to make it to Santa Cruz and see some of the beaches there and a few of us also hiked up Mt. Diablo to take in a scenic view of the Bay Area. There is so much to do around the Bay Area -- I’m looking forward to exploring it more during my next work term.

All in all, this semester has been an amazing experience. Working at Space Systems Loral has been a great learning experience and living in the Bay Area has been awesome. I’m looking forward to returning in the summer and I would definitely recommend applying for a co-op at Space Systems Loral.
Term 2 Job Summary

Space Systems Loral is a commercial satellite company located in Palo Alto, California. They primarily manufacture communications satellites. Some of their most well-known customers are Dish Network, DirecTV, and Sirius XM Radio. They also manufacture satellites for numerous international companies. I worked in the Subsystems Structural Analysis and Test group. The main function of this group is to perform all the structural analysis for subsystems within the bus of the satellite. The bus is the main body of the satellite and houses all of the electronics of the satellite, the heat pipe and propulsion systems, and supports the solar panels. The group I worked in is responsible for the structural analysis of all of these systems along with vibration and acoustic testing of these components and larger scale spacecraft vibration tests. Additionally, whenever there are any structural issues on a satellite my group is often responsible for figuring out the problem and coming up with a solution.

Since my first coop term was in the same department I was able to hit the ground running with work. I had already learned how to use all of their finite element software which was really nice because I was given more complicated projects than during my first term. I spent this summer working on Solar Array Analysis. I helped perform stress analysis and modal analysis on Solar Arrays for various satellite programs. The coolest part about the work I did this term was that nearly everything I worked on was used on current satellite programs.

Working through all of the analysis projects this summer has made me more proficient at using both FEMAP and PATRAN, and creating bulk data files to use with NASTRAN. FEMAP, PATRAN, and NASTRAN are FEM software packages commonly used in the aerospace industry. In addition to learning more about the software, I also learned a lot more about acceptable assumptions to make during structural analysis, got to see a tour of the Hi-Bay (where the satellites are assembled), and got a tour of one of the reflector manufacturing facilities. Content from ENGRD 2020, MAE 2120, MAE 3250, and MAE 3260 related to the analysis I did. The stress analysis focused on Von Mises Stress and Safety Factors, while the dynamic analysis focused on natural frequencies.

My work experience during this coop term was fantastic, but I still think the best part of the experience is that we were provided housing from the company in Santa Clara, California. In addition to our pay we were provided housing and full benefits. Our housing was only a short walk from the Cal Train station, grocery store, and about a 10 mile drive from Space Systems/Loral. Santa Clara is a nice area, there are tons of restaurants close by in San Jose and with the Cal Train so close, it's really easy to get to San Francisco, San Jose, or Stanford. We were able to go to San Francisco on multiple occasions and I had the chance to make it to UC Berkeley to visit a friend there as well. I was also able to make it to Santa Cruz and see some of the beaches there and explore more of the pacific coastline. All in all, this summer was a great experience. Working at Space Systems Loral has been a great learning experience and living in the Bay Area has been awesome. I would definitely recommend applying for a co-op at Space Systems Loral!
1 CO-OP WORK ASSIGNMENT

1.1 Company Overview
Space Systems/Loral (SS/L) is the world’s leading manufacturer of commercial satellites. SS/L designs and builds satellites and other spacecraft systems for both commercial and government customers from around the world. The primary services provided by these satellites include but are not limited to broadband digital communications, digital audio radio, and direct-to-home broadcast television. Some well-known customers include DirecTV, Dish Network, and Sirius XM Radio.

1.2 Bus Subsystems Operations / Control Electronics Design
Satellites are made up of many complex subsystems, one of them being the bus subsystem. A satellite “bus” is the general model and infrastructure on which many project/application-specific satellite payloads are hosted. Within this bus subsystems department, there are many smaller sections with varying responsibilities, including groups that specialize in structural analysis, thermodynamics, propulsion products, control/general electronics, solar arrays, and battery products.

Within the bus department, I was placed in the Control Electronics Design group. Control Electronics Design is responsible for the development of high-tech electronic trays that control the satellites propulsion, thrusters, telemetry, etc.

1.3 General experience
My overall experience at SS/L has been very positive. The co-ops (9 of us) were given a new hire orientation on the first day. From there, we were sent off to our individual sections to meet our supervisors. My supervisor explained during the first few days that the co-op experience is “what you make of it”. Instead of guiding my every step, he immediately gave me freedom and responsibility to discover the workplace myself. He gave me relatively loose guidelines of objectives to accomplish, a list of projects I could work on during my first term, and some engineers to contact to specific tasks. From there, I was allowed to do my work the way I wanted. This method of mentorship really allowed me to learn how to take initiative in the workplace and be proactive about my work.
2 MAJOR PROJECTS AND RESPONSIBILITIES

2.1 Internal Research and Design

2.1.1 Load box
One of main projects during my co-op was to support the production of a load box for an IRAD (internal research and design) project meant to help replace and integrate a new chip into existing engineering designs. By creating this load box, we would be able to simulate the load the new chip would be driving during operation, and hence be able to verify the functionality of the particular chip being tested as well as the functionality of the entire system’s design.

This project entailed the design, test, and physical fabrication of the above mentioned load box. When I first arrived, initial designs had already been decided (but nothing more than block diagrams and rough sketches). Although I was just starting out as a co-op, I was given a considerable amount of responsibility in the outcome of the load box. For example, it was my responsibility to draw up detailed manufacturing schematics, decide specific parts to use, and in general oversee the timely production of the product. As with any other engineering project, problems arose along the way, and I had the opportunity to troubleshoot them and either adjust or correct designs (probably where the most interesting thinking comes in). Other notable experiences related to this project included working with software GUIs, interacting with production technicians/manufacturing floor technicians, and gaining hands-on practice soldering and troubleshooting the design myself.

2.1.2 HALT
My second primary responsibility was to support a small team of engineers preparing and performing Highly Accelerated Life Testing (HALT) on a retrofit of existing control trays. Performing HALT on a test unit involves exposing the unit to environmental stresses (temperature and vibration levels) much beyond what is experienced by a satellite during launch and in space. By undergoing HALT, we as engineers are able to find operating/destruct limits as well as provide confidence to product robustness.

I arrived a fairly opportune time for this project, as HALT was still in a preliminary preparation stage. During my first couple weeks, I observed the team of various engineers (electrical, mechanical, thermal, project, and test engineers) interact and plan out the equipment setup and test procedure to be used. However, due to a change in schedule of test equipment availability, our team was rushed into HALT many weeks before we had planned. Because of this, our team was put under a much larger time constraint than we had originally planned for. The test engineers and operators (including myself) ended up working overtime during the actual testing period in order to finish our entire procedure before required test equipment was needed by other engineering teams. This particular experience gave me the opportunity to really experience just how fast-paced the workplace could become during crunch time.

After finishing HALT, I was assigned the job of writing the report and results of our tests. Documentation is crucial to any organization as it allows other employees to read test results and technical tidbits easily and effectively. The final report ended up being included in a critical design review of the control trays’ retrofit design, which was an interesting three hour presentation and review that included my slides concerning HALT.
2.2 Customer related work
Aside from IRAD projects, I had the chance to help in front-end, customer (organizations contracting to SS/L) related work. This included assisting co-workers with End Item Data Packages (documentation including all test/technical information relating to product components) and Sell-Off Reviews (presentation/overview of all information relating to product from start to finish). Being able to see both engineering aspects of work as well as front-end, customer work allowed me to more fully piece together just what I was doing in engineering and how it related to the final delivered product.

2.3 General group support
During slower periods or down time during projects, I’d make myself available to other engineers and co-workers and try to help them in any way possible. This included data retrieval, documentation, and adding a feature to an existing excel tool for leading-forming surface mount chips.

3 LIFE OUTSIDE OF CO-OP
One of the biggest perks of a co-op with SS/L (aside from the work experience) is life in California. SS/L provides corporate housing with dozens of amenities (pool, basketball/tennis courts, fitness center, etc.). The apartment complex is located in Mountain View, and just a couple blocks away from the supermarket, train station, and central downtown area full of restaurants. Transportation to work was provided via a free shuttle from the train station to SS/L campus. Outside getting to work, transportation around the bay area is simple and convenient through biking, riding the bus, or hopping on the Caltrain or BART.

There is plenty to do and see in California (trust me, you won’t miss Ithaca). During the weekends, we went to places such as San Francisco (city, sports games at the AT&T stadium), Santa Cruz (beach, boardwalk), Lake Tahoe (snowboarding), Ano Nuevo State Reserve (coastal hiking), Mount Diablo (mountain hiking), Stanford University/UC Berkley, and Great America amusement park. On weekdays, there are SS/L sports groups and recreational leagues to get involved in. I chose to explore sports activities outside of SS/L through online groups and local bay area leagues.

4 EVALUATION
When I first arrived in California, I had virtually no work experience relating to engineering nor any experience relocating to a completely unfamiliar area. The engineering co-op experience exposed me to both: interesting, relevant work at a great location. The combination of both these aspects, plus the multitude of people I was able to meet along the way made this experience memorable. Silicon Valley is a great place to be as a budding engineer. Choosing to do this particular co-op has probably been one of the best decisions I have made.
1 CO-OP WORK ASSIGNMENT

1.1 Company Overview
Space Systems/Loral (SS/L) is the world’s leading manufacturer of commercial satellites. SS/L designs and builds satellites and other spacecraft systems for commercial and government customers from around the world. The primary services provided by these satellites include but are not limited to broadband digital communications, digital audio radio, and direct-to-home broadcast television. Some well-known customers include DirecTV, Dish Network, and Sirius XM Radio.

1.2 Spacecraft Systems Engineering / Attitude Control Subsystems
The Spacecraft Systems Engineering department at SS/L is responsible for integrating all of the different subsystems of a satellite (most of which are combinations of mechanical, electrical, and software systems) and ensuring that mission requirements are met. A co-worker described the occupation to me in this way: “systems engineers must be very knowledgeable in ‘everything’, but are masters of nothing”. Typically, systems engineers are assigned to a particular satellite program to work on throughout its duration.

Within the systems department, I worked with Attitude Controls Subsystems (ACS) Engineering. Spacecraft attitude refers to the orientation and pointing of a spacecraft. ACS is responsible integrating the sensors, actuators, and control electronics in each satellite to ensure its proper positioning in space.

2 MAJOR PROJECTS AND RESPONSIBILITIES

2.1 Failure Modes, Effects, and Criticality Analysis
My primary project for my summer term was to develop and document a system-level Failure Modes, Effects, and Criticality Analysis (FMECA) for the entire Attitude Control Subsystem. The goal of this project was to help my department document the different ways our attitude control system could fail and the amount of coverage provided by on-board software systems for these failures. By doing this analysis, we expected to be able to identify existing system weaknesses and begin recommendation for future solutions.

In order to do my project, I had to first understand each unit within the Attitude Control Subsystem and the automated Failure Detection and Identification Software (FDIR) used to monitor the system. This involved reading and understanding several systems description manuals and spacecraft usage manuals. After learning the basics of how SS/L’s attitude control system worked, I had to take vendor FMECAs for all the different units of our attitude control subsystem (including earth sensors, star trackers, gyroscopes, reaction wheels, thrusters, etc.) and document the several different ways these units were known to be able to fail. From those unit failures, my job was to determine how each particular unit failure would affect the ACS and how the automated protection software would react in each case. In short, I had to look at low-level failures such as capacitors or transistors that had shorted/opened on particular sensors or actuators and conclude how that would propagate up to the much higher system level and affect a
spacecraft’s attitude control. In its entirety, this project took the entire term minus a couple weeks to finish.

2.2 General support
Towards the end of my term as I began finishing my FMECA project, I had the opportunity to provide general support for my department. These tasks involved revising technical memos, mapping telemetry documentation from our existing processor/system architecture to our new architecture, and parsing through flight procedures to document certain types of derived telemetry.

2.3 Experience gained
Coming into this term, I had no prior knowledge about spacecraft attitude or orbital control; my last co-op term was with a very different department at SS/L. As a result, this co-op term was a completely new experience that neither related to my classes nor my past work experience. While that may sound like a bad thing, I believe that’s what made this co-op term the most interesting. I had a chance to experience a new type of work (systems engineering) that was completely unlike my electrical engineering curriculum and very different from my last co-op experience that focused strictly on electronics and hardware testing.

3 LIFE OUTSIDE OF CO-OP
Like the first term of our co-op, we (the nine co-ops) were provided with corporate housing. Instead of being housed together in Mountain View again, we were split between two complexes: one in Santa Clara and the other in Sunnyvale. We chose to carpool to work this term instead of taking the Caltrain/company shuttle.

Outside of work-related activities, we spent most of our time exploring the bay area. During the weekends, we visited coastal parks and beaches (Point Reyes National Seashore, Monterey/Pebble Beach, Half Moon Bay, Santa Cruz), went camping (Big Basin Redwoods State Park), explored San Francisco, and went to a music festival (Outside Lands). All things considered, it was probably the most interesting and enjoyable summer experience I’ve had.

4 EVALUATION
I’m very happy to have participated in the co-op program. To have gained two different types of jobs experiences (electrical engineering and systems engineering during my first and second term respectively) while living in a completely new area was an incredible experience. I encourage all students who have the opportunity to participate in a co-op to do so.
Jamie Sternlicht  
jas734  
Mechanical Engineering  
Space Systems/Loral  
Summer 2012 (Second Term)  

Working in Repeater Subsystem Operations at Space Systems/Loral this past fall and summer has been an incredible experience. Space Systems/Loral is the world leader in providing commercial geostationary satellites. Perhaps unbeknownst to you, SS/L is involved in your life. Providing broadcast television, radio, broadband Internet and mobile communications all over the world. It was heartwarming to learn this summer that included in mobile communications was emergency and disaster relief, where if a boat is lost at sea it can send out an emergency signal, or if a hurricane hits we can provide communication. Space Systems/Loral is located in Palo Alto, CA, the center of one of the greatest tech bubbles in the world.  

SS/L has been incredibly kind to their interns and co-ops thus far, and has provided housing for as long as their co-op program has been in place. For both of my terms I was placed into corporate housing with Oakwood. First term I was in Mountain View while this summer I was in Sunnyvale. From the Mountain View train station there is a shuttle provided to work. From Sunnyvale we were able to get to the Mountain View station using the Light Rail. It was also rather convenient this summer (versus last fall), there were many more interns (over 70), so we were usually able to carpool to and from destinations.  

The companies HR department also provided many opportunities for all of the interns and new hires to come together. Not only were there lunches and breakfasts, but also soccer games and movie outings. In each housing complex there were at least eight summer hires, so we were always close to someone.
In Repeater Subsystem Operations I worked as a mechanical engineer. As mentioned previously, in our department we worked closely with electrical engineers to develop radio frequency (RF) technologies. Coming into this summer with the experience I had last fall, I was able to hit the ground running, and start to work on my goals. One of my biggest goals was to learn some sort of Finite Element Analysis (FEA). I was able to achieve this with the help of many coworkers. They taught me the basics of Pro-Mechanica and I quickly got to work doing structural analysis on a downconverter.

While I was not assigned a mentor, my boss and coworkers were all incredibly approachable, friendly and most importantly: knowledgeable. If my boss didn’t know an answer (which didn’t happen often) he would know where to direct me, and someone was always available to help me out if I was stuck.

Overall my experience with Space Systems/Loral as an engineering co-op student has been very enjoyable learning experience, and I would recommend applying to a position with them.
For the fall of 2011 I was assigned to co-op at the Spacecraft Testing and Analysis Software section at SS/L. Our section develops and supports software used for the satellites that SS/L builds, from powering the satellite, controlling the thrusters, to managing the exact payload functions. My assignment was to create a method for existing spacecraft software to run without any hardware. I was assigned to two other co-workers to work on this project. The purpose of this software is for a way to test out software and train new operators without the risk of damaging expensive hardware. When I first arrived, we were still unsure of the exact method to accomplish this and so I spent the first few weeks doing research. There were a few limiting factors at first however, although I've been programming in various languages for a while, I've never done any C, the language used in our software. Aside from doing research, I had to do much reading on C. But like for any language, I picked up most of C by just doing the coding in my work. Still, the code was very much cryptic at first; software that interacts directly with hardware is a completely different thing than that of higher level programming. Fortunately, my co-workers were available to help me out with any questions and guide me through my problems.

Eventually I found a method to solve the problem and began to work on it. My solution required libraries to be written to replace the existing hardware’s library; this meant I would have to reverse engineer the hardware’s function by analyzing what the software expects from the hardware. This atypical approach was something I’ve never done before and required extensive knowledge of hardware and software interaction. My major as an independent in robotics has helped me in this aspect since I had some understanding of both hardware and software. Nevertheless, not knowing the hardware’s internal functions explicitly required me to make many assumptions, some of which were not always correct. This resulted in me making functional but extremely customized libraries that would only work
for a specific hardware. If I was to go through the same experience again, I would want to thoroughly analyze the internals of the hardware and create a library capable of handling all the hardware at once.

As a robotics major, my concern is with every aspect of a device: mechanical, electrical and software. I like designing and figuring out the most efficient ways to work on all those three aspects. Specifics of the device are important, but the bigger picture and how parts of the device interact is even more important for me. This experience has allowed me to investigate the electrical and software aspect and has definitely helped in my professional development. Additionally, I was responsible for the specifics of the software and was free to approach it however I preferred. This freedom I think is the best aspect of the job, taking away any restriction that would limit my potential.

Outside the job, SS/L provides a generous free housing option not too far from work. The housing is a two bedroom with a shared kitchen. It is also fully furnished and comes with many amenities that far surpasses college apartment living. All the co-ops live nearby so we would often hang out on our free times after work or on the weekends. Since it was the bay area, there were many things to do and many places to go. But unfortunately all this required a car, which none of us on the site had. However, the public transportation here was decent enough to get to work, buy grocery and go shopping. Many of my fellow co-ops chose to ride the company shuttle to work, but I biked mostly. It was only a 4 mile bike ride and took no more than twenty minutes. It was a good form of exercise to reduce the stress of sitting all day at work, something I rarely had time for in school.

This was an enjoyable experience that has taught me many aspects of work after graduation. I’m excited to come back again next summer!