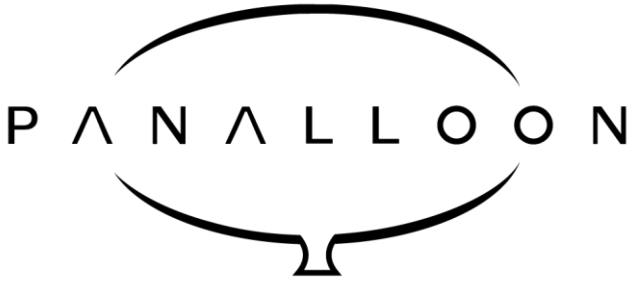
April 17th | 14



Post Mortem for SkySeed

Panalloon Systems

Prepared for

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1 Introduction

The amount of security for an outdoor event is often limited due to cost. As the event gets larger the cost increases and often security measures are overlooked. SkySeed is a real-time outdoor surveillance system attached to a helium weather balloon that is tethered at an elevation of 20-30 meters. Through a graphical user interface, the operator at a base station can observe and change the area of interest of the video feed. Figure 1.1 portrays the SkySeed model at a proof-of-concept level.

Figure 1.1: Panalloon System's implementation of SkySeed

2 System Design

SkySeed is an integration of multiple modules that together create a reliable and cost effective product. The aerial, motion and power systems along with the wireless network and software components constitute the core of SkySeed. Figure 2.1 below shows a basic diagram depicting the individual component that make up SkySeed.

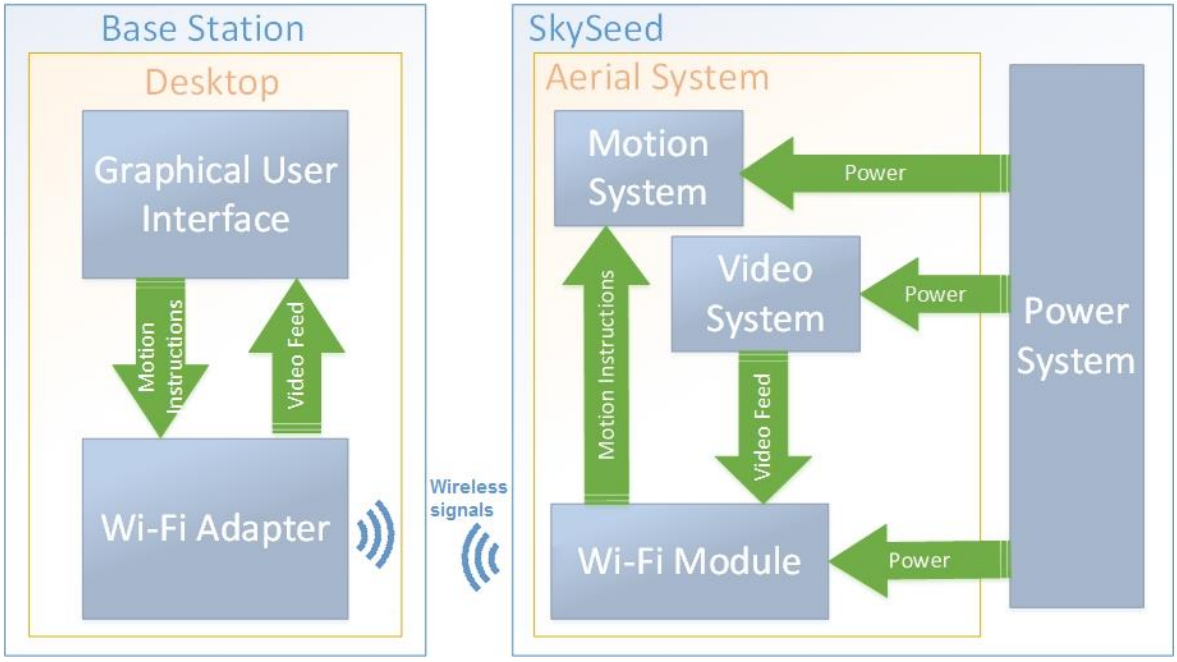

Figure 2.1: Block diagram depicting SkySeed's individual components

The aerial system lifts SkySeed to the desired height. The motion system works with the wireless network component to deliver the desired view to the UI. SkySeed is enriched with sophisticated software to move the camera wirelessly from a user interface at the base station. The signals sent from the router at the base will be received by the Wi-Fi-Shield and used to control the motion of the camera. Lastly, SkySeed power is provided by a reliable powering system at the base station. The system electronics is powered using a 12-volt battery and a power cable. These five components will be further described in subsequent sections.

2.1 Aerial System

The Aerial System is made up of three main components which are the balloon, netting and the enclosure linkage.

2.1.1 Balloon

The Balloon meets the following functionalities:

- Must be able to operate in remote areas
- Initial cost must be less than $200

- Must be re-deployable
- Must be able to lift a payload more than 1 kg
- Must have the ability to sustain long flight hours
- Limit vibrations to ensure video clarity

The balloon is used to sustain the enclosure and camera in the air. A 5.5ft helium chloroprene weather balloon was used to achieve the purpose. The selected helium balloon has a maximum helium volume of 2.46m^3 which cost approximately $50 of helium. Even though our system had a payload of 1.1 Kg the balloon is capable of lifting up to 1.78 Kg.

We faced a lot of difficulties dealing with the helium balloon such as the durability of the balloon which seemed to be a major problem. We actually ended up popping two balloons. Other problems we faced was cost and also not being equipped with pressure gauge which made us have to perform a lot of trial and errors in order to know when the balloon had enough helium for required lift.

2.1.2 Netting

The netting was used to cover the balloon and also ensure that the weight of the system is evenly distributed. Unfortunately since we were not able to purchase a net big enough net which wouldn't cause us weight issue. The solution we proposed was to construct our own net which was done by scaling up the dimensions for a 5.5ft balloon.

2.1.3 Enclosure Connection

The connection from the netting to the enclosure is essential to ensure the reliability and safety of the electronic components and camera. We decided to use four pulleys connected to the top of the enclosure with a cross connection as shown in Figure 2.1.3. This connection allows the enclosure to always remain parallel with the ground.

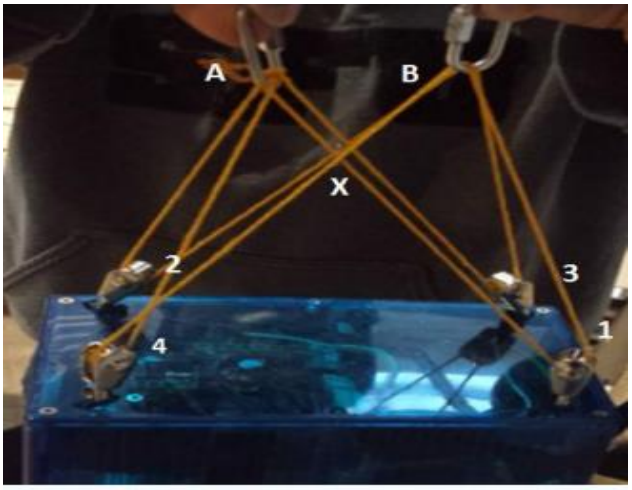

Figure 2.1.3.1 Enclosure links

2.2 Power System

The purpose of the power system is to meet the voltage and current demands of the electronic components that form SkySeed. Ideally, we also want the power supply to be onboard with SkySeed which requires a battery technology that has a high power density; however, due to budget constraints it was not a viable option. Instead we went with a more affordable but heavier lead-acid battery (12 V, 12 Ah). The downside of using this battery is the requirement of a 20 m power line. Shown in Figure 2.2.1 and Figure 2.2.2 are the lead-acid battery and 20 m line reeling system respectively. Using 20 m of line introduced resistance and inductance to the system which made the power source non-ideal. This caused significant problems to our servos, as they require instantaneous current draws. To compensate for this effect, we introduce a 2200 µF reservoir capacitor to meet the current demands of the servos. Finally we were able to measure the power consumption to be 3.6 W and 4.8 W when the system is idle (no pitch and yaw movement) and not idle respectively. These figures imply that SkySeed can operate for at least 30 hours and longer if it is not constantly in motion.

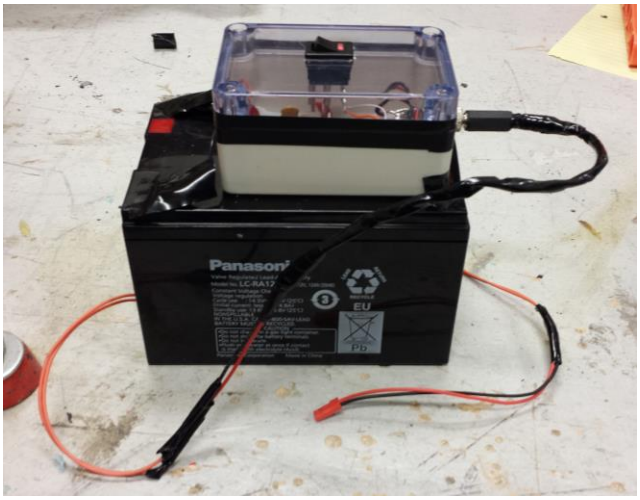

Figure 2.2.1 Lead-acid battery with switch box

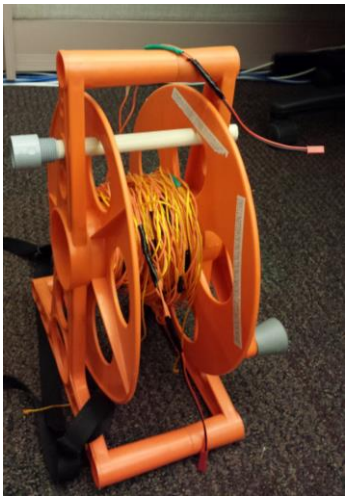

Figure 2.2.2 Power line reeling system

Since the lead-acid battery has the capability of outputting a large amount of current in a short amount of time, we allocated a great deal of time in the designing the safety features to protect users and the electronics. Developing this system was very challenging and stressful because it had a very small window for error (as the consequences are dire). As result, before combining the power system with the rest of the components, we had to put the system through a rigorous testing scheme.

In the future we plan on implementing only the necessary electronic components onto a single PCB which should drop the power consumption and reduce the weight. This would allow for the use of a lighter battery that could be onboard with SkySeed as well as allowing the use of a solar panel. These features would significantly increase the operation time. Another feature we would like to add is displaying the battery's power level to improve the usability.

2.3 Motion System

The purpose of the motion system is to allow the user to change the area of interest captured by the video camera. The operator can accomplish this through the provided graphical user interface. From the base station, the instructions will be sent wirelessly to the corresponding servo motor for yaw and pitch.

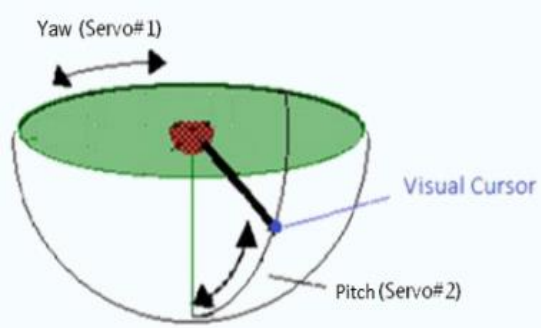

Figure 2.3.1: Motion System Workspace

Figure 2.3.2: Motion System Implementation

2.3.1 Motion Stabilizer

A gyroscope was used to compensate for torque being experienced via wind turbulence. The gyroscope picks up on the torque being experienced and translates that into servo motor motion to move in the opposite direction.

2.4 Wireless Network

The wireless network provides the connection that enables communication between the IP camera, the Wi-Fi shield, and the UI. The wireless aspect allows the user to access the video stream and control the camera orientation from anywhere within the network range. For reliability and security, we used a WPA2 encryption method and assigned the Wi-Fi shield and the IP camera static IP addresses.

The router we are currently using provides an insufficient wireless sleep for flight height above 15 meters. In the future we will use directional antennas, which will increase the vertical range of the router. With an increased vertical range, the wireless speed and throughput from the IP camera will increase and thus result in a higher quality video stream.

2.5 Software

The software component of the system includes both the Arduino microcontroller program and the user interface.

2.5.1 Arduino Program

The Arduino program provides the following functionalities:

- Acts as a Wi-Fi server accepting up to 4 incoming client connections
- Receives user input through Wi-Fi shield
- Processes user input and controls servo motors accordingly
- Provides compensation by use of a gyroscope

Applying a bottom-up design methodology allowed us to get the basic code working early, and add functionality throughout the semester. Since we started developing this program in the first two weeks, we were able to spot possible issues early on. For example, we encountered an issue concerning Wi-Fi connection loss when integrating the servo motor code. The solution was to power the Arduino and servo motors independently.

The Wi-Fi server allows access and controllability by up to 4 clients. In order to avoid multiple clients rotating the camera in conflicting directions, in the future a feature should be added to give only one client the ability to control the servo motors. Another feature we hope to add is image auto-rotation of the camera image, instead of giving the user the freedom of rotating the image as we are now doing. Auto-rotation would be implemented by using an accelerometer together with the gyroscope to calculate the correct orientation and communicate this information to the UI.

2.5.2 User Interface

The UI serves as the primary control interface of the system. It provides the user with high level abstraction of all of the functionalities of our system, while remaining simple and user-friendly. The UI is fully designed using a C# Windows Form Application, making use of the AForge.NET framework for video streaming functionality. Beyond controllability, the UI also provides status updates such as fps (frames per second). The main features of the UI are as follows:

- Streams IP Camera video feed
- Controls camera orientation
- Sets motion speed from3 options: slow, normal, and fast
- Rotates image according to user preference
- Records video for up to 10 min intervals
- Provides playback option when recording stopped

A screenshot of the user interface is shown in Figure 2.5.1.

Figure 2.5.1: Screen capture of the SkySeed user interface

3 Materials and Cost

At the beginning of the project we estimated the cost of each component required to build SkySeed. Our total estimated cost to complete the project was $962.50 with a 10% contingency. As shown in the Table 3.1 some components were underestimated. Other components such as the weather balloon were insufficiently estimated compared to the actual spending incurred. To compensate for our increase in spending, we opted to not use a solar panel which allowed us to design our final product with a total cost of $1076.81 keeping us within 10% of our initial estimate.

Table 3.1: Cost breakdown for SkySeed

Item	Projected Cost	Actual Cost	Difference
WI-FI Camera	$160.00	$94.52	$65.48
WI-FI Shield	$35.00	$99.95	($64.95)
Solar panel	$90.00	-	$90.00
Servo Motor	$60.00	$37.13	$22.87
Arduino Uno	$50.00	$38.70	$11.30
Weather Balloon	$70.00	$195.97	($125.97)

Helium Tank	$150.00	$324.00	($174.00)
Rechargeable Battery	$40.00	$45.00	($5.00)
Miscellaneous	$100.00	$179.04	($79.04)
▪ **Tarp**	---	$10.76	
▪ **Electronic bedding**	---	$18.00	
▪ **Wood for bracket**	---	$7.97	
▪ **Zap straps**	---	$8.00	
▪ **Circuit components**	---	$24.80	
▪ **Breadboard**	---	$10.00	
▪ **Power Regulator**	---	$11.50	
▪ **Import tax**	---	$79.96	
▪ **Parachute components**	---	$8.05	
Shipping Cost	$120	$62.50	$57.50
Total	$875.00	$1076.81	($201.81)
Total + 10% Contingency	$962.50	$1076.81	($114.31)

4 Schedule

Panalloon Systems constructed a project plan to ensure that all deadlines were met and to guarantee the successful development of SkySeed. Figure 4.1 displays the project planning timeline containing both our expected and our actual milestone dates.

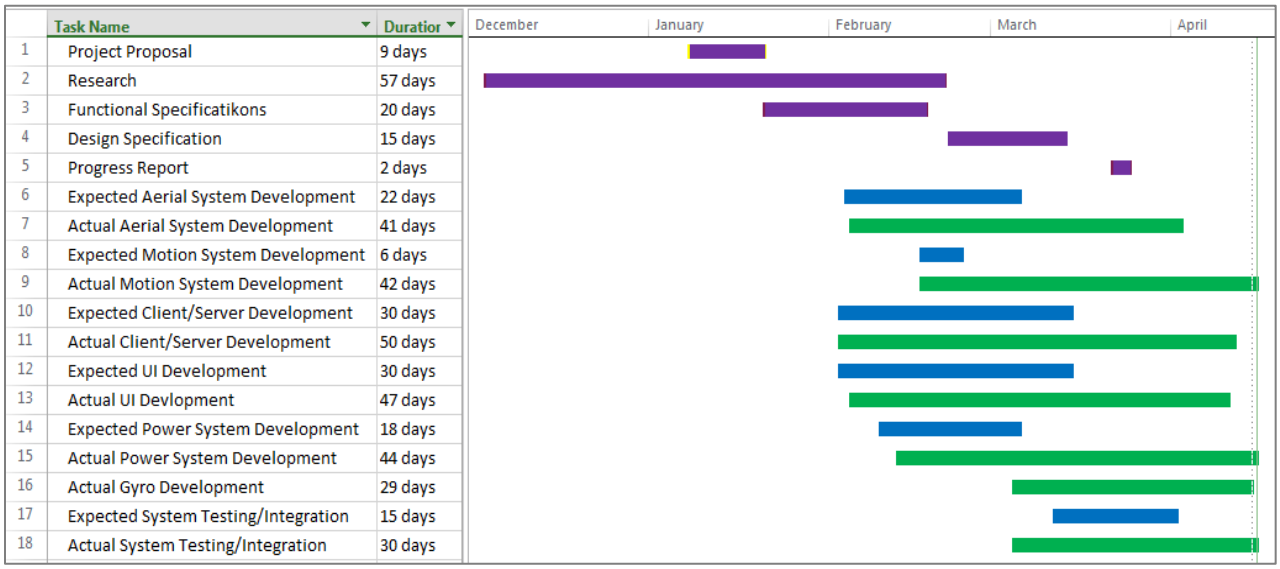

Figure 4.1: Gantt chart displaying the SkySeed project schedule

The development milestones were set in such a way that the software and hardware components were developed and tested individually and in parallel to ensure the proof-of-concept delivery. As shown in the Gantt chart, our development stages took longer than expected. This was due to unforeseen issues that appeared during the system integration and

testing stages. Another factor that caused this discrepancy was the additional features that we chose to implement such as the gyroscope compensation. Even with this schedule delay, we were able to meet our final demo deadline of April 17.

5 Team Dynamics

Members of Panalloon have worked together on numerous of past projects. Because of this familiarity, it was no challenge for us to quickly organize the team and assign tasks based on each individual's strengths and weaknesses.

Technical problems arose quite frequently, however all members took responsibility in debugging and resolving the issues. Each member of Panalloon had grasped a well-rounded knowledge base for all aspects of SkySeed. This became an asset in the event of members being absent development. The table below outlines the responsibilities embraced by each member corresponding to their expertise.

Table 5.1: Work-load breakdown, where XX = primary responsibility and X = secondary responsibility

High-Level Task	Amir	Michael	Shayan	Milad	Sarah
Aerial System	X	X	XX		
Motion System	XX	X		X	
Power System		XX		X	
Wi-Fi server development				X	XX
User Interface				XX	X
Wireless Network				XX	XX
System integration	XX	X	X	X	X
System testing	X	X	X	X	X
Material research	X	X	X	X	X
Competition research	XX		X		
Budget and finance		X	XX		
Documentation	XX	X	X	X	XX
Administrative tasks	X				XX

6 Individual Reflections

6.1 Amir Shamsuddin

From day one SkySeed seemed like a great project as it evolved all aspects of engineering that was taught to us by ENSC at SFU. Such a vast project was able to make the most of Panalloon diverse skill set. Michael Nugyen, Milad Bonakdar, Shayan Azizbeagi and Sarah Elmasry are all well rounded engineers and we were all able to have a helping hand in all corners of development.

I mostly worked on developing a motion system. I got a chance to work and learn a lot about gyroscopes and servo motors. I was able to use many of the knowledge I gained in courses like ENSC 387 to make to best motion system of my understanding. The biggest lesson I learn was that "You can never do enough research when selecting parts". I realized this half way through the semester when I realize our lives would have been a whole lot easier had I chosen Stepper motors instead of Servos to implement the motion system. This also forced t the software team to develop more complex algorithms than necessary to provide user with controllability. Apart from motors I learn a great deal about gyroscopes. Both Michael and Milad helped me a great deal with overcoming some electronics and programming aspects of implementing this sensor. This part of the project is definitely one of the things we are most proud.

Apart from engineering, I learned how important and difficult it can be to delegate in a larger group. And how most of the development cycles are dependent upon how efficiently the group delegates and communicates without being too abrupt in the expression of idea.

It was definitely a semester to remember. Working with 4 of my close undergraduate friends, It was easy to get everyone on the same page in terms of the project vision. At times the project did not feel like work and at other times this worked to our advantage, and at others it was what prevented the team from progressing faster. All the long hours Michael and I spent making and re-making the bracket/enclosure did not feel like work, during the coding and development hours with Milad and Sarah and also, setting up the balloon out doors in the cold weather with Shayan. I gained many valuable lessons, of which the most important is putting in the hours will pay off. The more you spend researching and asking around and looking at what other people have done, the more you can catch on foreseen problems. So it is critical to put in the most hours at least when completing the critical path. Fortunately we were able to do that, and that lead us to the completion of this project on time and demo successfully.

6.2 Michael Nguyen

Without a doubt this was the most ambitious, interesting, and unique course project I've ever participated in. It combined aerodynamics, power electronics, electromechanical systems, and embedded systems. Before our group could even settle on the idea of this project, we had to be sure that such an idea was feasible and that it would be affordable. As a result, I got to learn about the different concepts in aerodynamics and buoyancy. Which I then used to estimate the amount of helium required and determined that indeed it would be affordable.

My main task was to develop the power system. This was very daunting task because it was a critical component of the project, it had little room for error, and I never had any prior experience with power. With some research and consultation with experts in this field, I was able to learn about: power regulation and their safety methodologies. Further I got to learn about different passive and active components that were used for power applications such as the resettable fuse and bulk regulator.

Although my main task was to develop the power system, I also got a chance to work with Amir to develop the motion system. He was using servos and an Arduino UNO board to implement the yaw and pitch motions. As a result, I got to learn how these devices work and understand their limitations which proved to be very useful for me to design the power system. In addition to developing the motion system, I also got to work with Amir on the yaw compensation mechanism. Amir used a gyroscope sensor to obtain the angular velocity readings which is then fed into the microcontroller to move the servos accordingly. This was a great experience, because I never got to work with a gyroscope and also never got to implement a motion controller onto a real physical system before.

In general, not only this project exposed me to engineering and scientific concepts, it also gave me experience in a variety of workshop skills such as wood working, soldering, pneumatics, and even sewing. It also improved my ability to collect information resources, whether if it's from the internet, the library, consulting with experts from industry or academia. This project also taught how develop of large technical documents in a team setting as well as planning a project efficiently and effectively.

For me, I felt that the most valuable learning experience for this course is from working in a group. I learnt that being able to communicate your thoughts and ideas coherently as well as listening effectively is very important for everyone to be on the same page. Another important skill that I learnt from this course is that my ability to suggest alternatives or issues to group members in a diplomatic fashion has improved. Overall I found that it was a pleasure in working with the members of Panalloon Systems. The mood was always light and never too serious. And even when everyone is busy with their respective tasks we all still offer a helping hand when it's needed.

6.3 Shayan Azizbeaigi

It has been a privilege for me to work with a group of engineers who are also my friends. It has been an honor to share similar passion and drive to develop SkySeed. Our team was constructed of five engineers highly skilled and knowledgeable in different respective fields which allowed us to implement the individual systems. Over the past four months, I have been able to witness everyone's skill and knowledge first hand as we put countless hours into our project.

My main responsibility for the project was to create the Aerial System. I was assigned this role by our CEO and accepted the challenge even though I lacked the required knowledge. I had to research a lot to ensure that I had the required knowledge. I gained a lot of mechanical skills working on the enclosure connection to ensure we had an efficient connection to the enclosure. I was able to take advantage of my design knowledge gained from my prior courses to ensure the safety and reliability of any system I designed.

I was fortunate enough to work with a professional team with good people and good energy. I gained skills that helped become more of a professional engineer from the technical discussions and meetings with companies and other professionals' .I improved my project planning, time management, communication, and problem solving skills throughout the semester.

Through the project we encountered many challenges and difficulties. It was wonderful how every team member was able to work together towards a unified solution and not put unnecessary blame or pressure on any particular member. What I found most challenging about this project was the dependency of the sub systems on each other. This made it difficult to have progress have when one of the system developments was on a halt. Also another issue I faced was due to our budget constrain I was not able to implement the system with some components that I found most efficient.

The project was one of the most enjoyable and exciting experiences I had at my education in SFU allowing me to combine all my skills and knowledge to see the success of our project. I would have liked to have improved my note taking skills in my engineering journal which would make referring back to old research and designs a lot easier. Also I am glad to have improved my documentation skills which will help me in my future as a professional engineer.

6.4 Milad Bonakdar

During the past four months I have had the chance to work on a project with a great group of people. Together we have worked hard and put in long hours to achieve our set goal of designing SkySeed. Going through this hardship I have gained an unbelievable amount of knowledge and experience, in technical and group work aspects. In order to develop SkySeed I took on the responsibilities of chief technical officer (CTO) of Panalloon Systems. I was responsible to help my group members in any of their respected roles. This role provided me with the opportunity to gain both software and hardware knowledge. My main responsibility was to work on the software of SkySeed with Sarah Elmasry, and to develop a User Interface (UI) for wireless control of out camera. In order to tackle this problem we first attempted to create a client/server windows form application using Vb.net. Since I had never developed in Vb.net, I learnt many new skills. I learnt how to create a form application and to use TCP to connect to a network. After this stage we worked on obtaining a video stream and placing it on our UI. This task forced us to switch to C# programming, since we needed to use the Aforge library to capture our video stream from a specified URL. Again I had never used C#, but learning it after Vb.net proved to be very easy. In our new application I learnt how to use socket programming to improve our client/server application and take advantage of .net framework powerful features. Furthermore I also learnt how to use the Arduino Wi-Fi shield as a server for SkySeed. This was a very interesting task as I had never before used an Arduino microcontroller. As the CTO of Panalloon I was involved in all the development stages of SkySeed. As a result the next stage required us to integrate our client/Server application with the Servo motors used to control the camera. This proved to be a very long and difficult task since we were not able to maintain a connection while moving the servo motors. After a hard and rigorous time I learnt that we need to provide power separately to the servo motors since they cannot be powered from the microcontroller due to the power consumption of the Wi-Fi shield. This was one of the lessons I learnt with regards to power. During the final stages of development I helped Amir implement a motion compensation algorithm using a gyroscope. This gave me the opportunity to work with a gyroscope for the first time and allowed to understand the basic theory of sensors. After this stage I was once again involved in power problems of SkySeed. Due to length of our cable/tether (20 meters) we were losing a significant amount of power. As a result, after talking to professors and lab technicians we were able to solve the problem by taking advantage of 2200 microfarad capacitor. As I have described this project has allowed me to work in many different fields of engineering. One of the most interesting was the machine shop training that was provided for the class. This training provided me with some basic knowledge to use the machine shop facility at the university. Furthermore, I also had the chance to work with a helium tank and understand the basic knowledge of using a regulator for a gas tank.

Finally the writing intensive section of this course allowed me to develop my writing and communication skills. I was also able to practice my public speaking skills by the presentations and demos that were required for this course.Overall this project and this course have provided me with a great deal of knowledge and wonderful memories. We were able to work as a group to develop a product in a set period of time. The ability to finish this project and work with such good group mates gives me great joy and fulfillment.

6.5 Sarah Elmasry

It has been a great experience working with my Panalloon Systems team members. Amir, Michael, Milad and Shayan have all proven their knowledge, reliability, and determination as engineers. We have had an unforgettable time working together and bringing each of our strengths together to produce the SkySeed proof-of-concept.

As Chief Operating Officer (COO) of Panalloon Systems, my responsibilities included organizing meeting, submitting meeting notes, organizing and formatting documentation, keeping track of schedules and due dates, and assisting the CEO in overall project planning. To keep our documentation organized, I created a shared Dropbox folder. This folder was used for each of the main ENSC 305 documents, as well as meeting notes, updated schedules, software code, and relevant links and resources. I had the responsibility to post the meeting minutes in this Dropbox directory after every Panalloon meeting.

In terms of product development, I worked with Milad to develop the software and the Wi-Fi network aspects of the project. The first software component we tackled is the Arduino UNO programming. The Arduino is responsible for receiving user commands via the Wi-Fi shield and controlling the servo motors accordingly. We used Arduino's available Wi-Fi and Servo libraries to simplify this development task. Next, we had to learn C# in order to create a Windows Form Application to develop the UI. The UI acts as a client connected to the Arduino Wi-Fi shield server and uses TCP to transmit user commands. The biggest challenge we encountered is ensuring connection reliability and the redundancy necessary to be dependable in each possible network disconnection situation.

Beyond technical skills, this experience has greatly improved both my skills working in a team as well as my communication skills. I was lucky to have a group that worked so well together and had minimal tension. I learnt how to give my opinion, justify it, and accept which ever democratic decision we come to as a group. I also learned how to listen to everyone, understand their opinions, and make sure everyone has a chance to be heard. Not only did this class develop my oral communication skills, the writing-intensive documentation aspect also helped me to improve my professional writing skills. I am certain that writing technical documents in the future will be much easier and the results will be much better because of the practice I had in this course.

This course has been one of the most valuable experiences I have had at SFU. By allowing us to put together all the skills and knowledge we have acquired throughout our degree and create a complete product in just one semester, this course gave us the opportunity to grow as engineers. It has been truly rewarding to see a product through all its stages and to see it come to life in four months.

7 Conclusion

Panalloon was determined to develop an outdoor panoramic surveillance system that can monitor a large area. In the past four months, Panalloon was set out to accomplish a basic proof-of-concept that reflected all relevant functional specifications as well as a few extended features. On April 17th, Panalloon was able to demonstrate the completion of the SkySeed project. As all members had a unique learning experience, it is imminent we will follow through with further augmenting Panalloon system as a registered cooperation.

Appendix A: Meeting Minutes

Meeting Minutes

Meeting number #1
Date December 27, 2014

Members present: Milad Bonakdar , Michael Nguyen, Amir Shamsuddin, Sarah Elmasry

Absent: Shayan Aziz Baeigi

Meeting Notes:

- Discussed possible project options:
  - Helium balloon surveillance system
  - Office massage chair
  - Car tiredness detection
- Surveillance system:
  - Read article Mike found about Helium balloon system and the sail they used for stabilization
  - Electronics inside or outside balloon? Outside
  - Tethered at how many point to the ground? 4 for more stabilization
- Discussed team roles:
  - CEO: Amir or Sarah?
  - Can we have co-CEO's?

Meeting Minutes

Meeting number #2
Date January 5, 2013

Work-Order: Weekly meeting

Present: Milad Bonakdar , Michael Nguyen, Amir Shamsuddin , Sarah Elmasry

Absent: Shayan Aziz Baeigi

- Meeting Started at 4:00
- Adjourned at 9:30 p.m.
- Minutes submitted by Amir Shamsuddin

New business:

TOPIC	OUTCOME	TBD	TIME
Hardware Board components	Established modules and features • Radio/Wifi module • Video encoding/decoding module • Power type • LED For debugging • Heat sink/fan • Temperature sensor	• **Deadline for ordering part** • Selecting Microprocessor :PandaBoard ES, Beagle Board • Wifi or RF Band • Power unit, whether battery, land wire, solar • Establish Appropriate camera specs • Servo motor type/size/specs	**~2 hrs**
Fixed weekly meeting	Wednesdays 4pm: Group room in Library. Time will be booked by Sarah	• If Library not possible , Amir's House	
Company name	Suggestions made • Panaloon • MMASS • Aerial Vision	Not finalized	**~30mins**

Bureaucratic roles	Group structure for now *CEO Amir : • Minutes • Represent group face • Company name • Incorporating group *CFO Shayan Aziz • Budgeting group accounts • Signing off spending amounts • Strategize external funding methods • Marketing head COO Sarah Elmasry • Organize meetings • Assemble journals • Responsible for tracking deadlines and submission	Who will make shipping orders Not finalized since before first lecture	**~20 mins**

Old business: --

Meeting Minutes

Meeting number #3
Date January 8, 2013

Work-Order: Weekly meeting

Present: Milad Bonakdar , Michael Nguyen, Amir Shamsuddin , Sarah Elmasry

Absent: N/A

- Meeting Started at 4:00
- Adjourned at 8:00 p.m.
- Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME
Proposal Breakdown	Outlined the following: • Purpose of the project • Project scope, including requirements • Technology transfer • Market lookout • Budget (different options)	• Budget not finalized • Project planning (milestones) • Competition • Risks and benefits	**~2.5 hrs**
Discussed how we will write proposal	• We will divided such parts of the proposal such as milestones, budget, and team organization • One or two members will write the remaining sections, in order to avoid having different writing styles • Each member of the group will edit the proposal	• Dividing sections	**~20 mins**

Discussed parts and when to start ordering	• Will start ordering parts after proposal is written and the team has spoken with Andrew • We hope to start ordering parts by next week	• Comprehensive list of parts	**~1 hr**
Company name	Suggestions made • Panalloon • MMASS • MMASS Security Solutions • Aerial Vision	Not finalized	**~10mins**
Product Name	• Panalloon	Not finalized	**~10 mins**

Old business: --

Meeting Minutes

Meeting number #4
Date January 10, 2013

Work-Order: Weekly meeting

Present: Milad Bonakdar , Michael Nguyen, Amir Shamsuddin , Sarah Elmasry

Absent: Shayan Aziz Beaigi

- Meeting Started at 10:40am
- Adjourned at 2:30 p.m.
- Minutes submitted by Amir Shamsuddin

New business:

TOPIC	OUTCOME	TBD	TIME
Assigning Proposal Breakdown	• Mike: Project planning and Milestones • Shayan: Budget and cost,income • Amir: Executive Summary • Milad: Introduction • Company Detail: Personal contribution. Amir: Company description • Sarah: Scope	• Conclusion • Marketing	**~3 hrs**
ESSEF Funding	• Sent email to ESSS Vice president	• Meet ESSS to arrange presentation	**~30 mins**
Discussed a new concept of potential project	• Write band that taps into human thermal energy to charge auxiliary electronic device • Conclusion: We will stick to Original idea	N/A	**~1 hr**

Meeting Minutes

Meeting number #5

AGENDA

January 12, 2014

1:00-2:00 pm

Purpose of Meeting:

- To discuss option regarding parts in order to find our budget and to discuss proposal progress

Items for Discussion:

- Compare development boards and cameras
- Proposal progress
- Product name

Meeting Minutes

Meeting number #5

MINUTES

January 12, 2014

1:00-2:00 pm

Work-Order: Progress meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

- Meeting Started at 1:00pm
- Adjourned at 2:00 pm
- Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME

Parts	• Found two or three options for each of the following components:
	  ○ Camera
	  ○ Dev board
	  ○ Power sources
		• Finalize list of parts	**~30 mins**

Proposal Progress	• Scope section is complete
	• Division of proposal sections:
	  ○ Milad: Intro/conclusion
	  ○ Amir: Executive summary, market/competition
	  ○ Michael: Project planning
	  ○ Shayan: Cost/budget
	  ○ Sarah: Risks and benefits
		• Company details	**~10 mins**

Product Name	• MMASS • Aerocam • Aircam	Not finalized	**~10 mins**
Panalloon domain	• Bought www.panalloon.com		**~20 mins**

Next Meeting: Wednesday, January 15, 2014 at 4:00pm

Meeting Minutes

Meeting number #6

AGENDA

January 15, 2014

4:00-5:00 pm

Purpose of Meeting:

- To discuss proposal progress

Items for Discussion:

- Discuss issues that arise while writing proposal
- Assign incomplete sections to be written
- Finalize product name

Meeting Minutes

Meeting number #6

MINUTES

January 15, 2014

4:00-5:00 pm

Work-Order: Progress meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME

Proposal progress	• Completed sections of proposal:
	  ○ Introduction/Conclusion
	  ○ Executive Summary
	  ○ Scope
	  ○ Risks and Benefits
	  ○ Project Planning
	  ○ Cost Considerations
	• Remaining sections:
	  ○ Milad: product schematic
	  ○ Amir: market/competition
	  ○ Michael: letter of transmittal
	  ○ Shayan: Company details
	• All sections still need to be edited
		N/A	**~ 40 mins**

Product Name	• SkySeed	N/A	**~ 20 mins**

Next Meeting: Wednesday, January 22, 2014 at 4:00pm

Meeting Minutes

Meeting number #7

AGENDA

January 26, 2014

1:00-2:00 pm

Purpose of Meeting:

- To discuss ESSEF presentation and parts research

Items for Discussion:

- Plan ESSEF presentation and set time to practice before presentation date
- Discuss parts research done by members
- Assign tasks for next meeting

Meeting Minutes

Meeting number #7

MINUTES

January 26, 2014

1:00-2:00 pm

Work-Order: Progress meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME
ESSEF presentation	• Amir is responsible for the 5 minute presentation • The questions will be mostly answered by Amir, but other members will help out • We will practice the presentation Tuesday, January 28th before our presentation time	N/A	**~ 40 min**
Research distribution	• Michael: power issues • Sarah: Wifi command sending and receiving, interfacing with UI • Milad: Java applet for UI • Shayan: Researh and contact balloon distributors • Amir: Preparing for presentation	N/A	**~ 20 mins**

Next Meeting: Wednesday, January 29, 2014 at 4:00pm

Meeting Minutes

Meeting number #8

AGENDA

January 29, 2014

4:00-5:00 pm

Purpose of Meeting:

- To discuss functional specifications

Items for Discussion:

- Assign sections for functional specifications
- Discuss parts and when to order parts

Meeting Minutes

Meeting number #8

MINUTES

January 29, 2014

4:00-5:00 pm

Work-Order: Progress meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME
Functional specifications	• Milad: Inro/conclusion, sustainability • Michael: letter of transmittal, block diagram • Amir: System overview • Sarah: System overview • Shayan: Engineering standards	N/A	**~ 30 mins**

Parts	• Balloon testing next week
	  ○ Weight test
	  ○ Stability test
	  ○ Video quality test
	• Buying balloon and camera asap
	• Balloon: where to store when filled?
	  ○ Somewhere on campus?
	  ○ Storage facility?
	  ○ Someone's house/backyard?
		N/A	**~ 30 mins**

Next Meeting: Wednesday, February 5, 2014 at 4:00pm

Meeting Minutes

Meeting number #9

AGENDA

February 5, 2014

5:00-6:00 pm

Purpose of Meeting:

- To discuss progress and assign weekly tasks

Items for Discussion:

- Functional specifications progress
- Results of balloon testing and possible causes of balloon pop
- Assign development tasks for the next week

Meeting Minutes

Meeting number #9

MINUTES

February 5, 2014

5:00-6:00 pm

Work-Order: Progress meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME

Functional specifications	Sections written:
	• Intro and conclusion
	• Letter of transmittal
	Sections discussed:
	• System overview breakdown
	  ○ General requirements
	  ○ Physical requirements
	  ○ Performance requirements
	  ○ Power requirements
	  ○ Environmental requirements
	  ○ Sustainability requirements
	  ○ Aerial requirements
	  ○ Video System requirements
		• Standards: whether to include in requirements or to have a separate section
		• User manual section
			~ 30 mins

	○ Motion requirement		
Balloon test #1	• Balloon testing results • Chloroprene balloon popped • Durability issues • Weight issues • Amir will call Carlos and tell him what happened, discuss possible causes • Shayan will research alternative balloons in order to find a more durable option	• Balloon material	**~15 mins**
Weekly tasks	• Amir: servo motor programming • Michael: power analysis • Shayan: Test planning, mechanical design, balloon research • Milad: User interface, video stream embedding • Sarah: WiFi communication	N/A	**~15 mins**

Next Meeting: TBD

Meeting Minutes

Meeting number #10

AGENDA

Meeting Minutes

5:30-6:30 pm

Purpose of Meeting:

- To discuss development progress

Items for Discussion:

- Schedule next stage of balloon testing
- Assign weekly tasks

Meeting Minutes

Meeting number #10

MINUTES

February 12, 2014

5:30-6:30 pm

Work-Order: Progress meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME
Balloon test #2	• Next Wednesday or Friday, depending on the balloon arrival date	N/A	**~15 mins**
Weekly tasks	• Michael: figure out solar panel by Friday • Milad and Sarah: Transmit signal from base station to wifi shield – by friday • Shayan: Enclosure design by Monday • Amir and Mike: Receive and implement directional commands	N/A	**~30 mins**

Next Meeting: Monday, February 17, 2014 at 4:00pm

Meeting Minutes

Meeting number #11

AGENDA

February 17, 2014

4:30-5:30 pm

Purpose of Meeting:

- To discuss development issues

Items for Discussion:

- Connection drop issue
- Helium update

Meeting Minutes

Meeting number #11

MINUTES

February 17, 2014

4:30-5:30 pm

Work-Order: Progress meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME

Wi-Fi connection drop	• Possible solutions:
	  ○ Try another router
	  ○ Different Wi-Fi channel
	  ○ Timer interrupt
		N/A	**~15 mins**

Helium	• Science store says funding number is invalid • Mike will talk to Andrew about it	N/A	**~15 mins**
Netting	• We have a net! Testing next week hopefully, as soon as we get helium	Testing #2	**~15 mins**

Next Meeting: Wednesday, February 26, 2014 at 6:00pm

Meeting Minutes

Meeting number #12

AGENDA

February 26, 2014

6:00-7:00 pm

Purpose of Meeting:

- To discuss development progress and to schedule next round of testing

Items for Discussion:

- Power: Solar panels or no solar panels?
- Lift issue: What are possible solutions?
- Physical issues: How to avoid components rattling in the wind? How to keep balloon stable?
- Tasks for next week

Meeting Minutes

Meeting number #12

MINUTES

February 26, 2014

6:00-7:00 pm

Work-Order: Progress meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME
Power	• Battery on the ground instead of solar panels • Decision was made on account of cost and weight restriction	N/A	**~10 mins**
Lift	• If weight is too much for a single balloon to lift, we will need to use two balloons	N/A	**~10 mins**
Physical issues	• Need to design components in such a way to stabilize components and in order to obtain a low-jitter video feed	N/A	**~15 mins**

Tasks	Amir: • Wooden bracket around camera, done by Friday Shayan: • Netting Michael: • Power Milad: • Buy router from Walmart • Test old and new router range early next week Sarah: • Test routers with Milad	N/A	**~30 mins**

Next Meeting: Monday, March 6, 2014 at 7:00pm

Meeting Minutes

Meeting number #13

AGENDA

March 6, 2014

7:00-7:40 pm

Purpose of Meeting:

- To plan oral progress report and design specifications

Items for Discussion:

- Oral progress report
- Design specifications

Meeting Minutes

Meeting number #13

MINUTES

March 6, 2014

7:00-7:40 pm

Work-Order: Documentation meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME
Oral progress report	• Introduction/background: Amir • Schedule: Mike • Financial: Shayan • Progress: Milad and Sarah • Remidiation/summary: Amir	N/A	**~20 mins**
Design specifications	• Letter of transmittal – Mike • Title page • Abstract - Amir • Table of contents • List of figures • List of tables • Acronyms – Everyone is in charge of their own • Glossary – “	Remaining sections such as letter of transmittal, abstract, introduction, conclusion	**~20 mins**

	• Introduction – Shayan • System overview – Sarah and Milad • General system design – TBD • Aerial system design – Shayan and Mike • Power system design – Mike • Motion system – Amir • Wireless network – Sarah and Milad • Software – Sarah and Milad • Test plans – Everyone is in charge of their own • Conclusion – Shayan • References – Everyone is in charge of their own		

Next Meeting: Monday, March 16, 2014 at 7:00pm

Meeting Minutes

Meeting number #14

AGENDA

March 16, 2014

1:00-2:00 pm

Purpose of Meeting:

- To discuss development issues and assign tasks

Items for Discussion:

- Development issues
- Assign tasks

Meeting Minutes

Meeting number #14

MINUTES

March 16, 2014

1:00-2:00 pm

Work-Order: Progress meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME
Router	• Power? Alternative power source or power with battery? • Verdict: battery	N/A	**~10 mins**
Gyroscope	• Would add a feedback element to the project • Verdict: Amir will research and buy one	N/A	**~10 mins**
Tasks	Milad and Sarah: • Make UI look better • Add recording feature	N/A	**~40 mins**

	• Speed selection algorithm on UI and arduino • Static IP addresses • Disconnection and reconnection • UI buttons greyed out when disconnection • Rotate camera image Amir: • Fix gear box • Buy gyro and program it • Enhance and decrease weight of bracket Mike: • Order helium ASAP! • PCB wire connection • Reeling in the balloon (work with Shayan) Shayan: • Netting • Connection of balloon to enclosure • Reeling in of the balloon		

Next Meeting: March 23, 2014

Meeting Minutes

Meeting number #15

AGENDA

March 23, 2014

1:00-1:30 pm

Purpose of Meeting:

- To discuss development issues and progress report

Items for Discussion:

- Progress report
- Development issues

Meeting Minutes

Meeting number #15

MINUTES

March 23, 2014

1:00-1:30 pm

Work-Order: Development issues

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME	TBD	TIME
Progress report	• Intro: Milad and Sarah • Schedule: Amir • Finances: Shayan • Hardware progress: Amir • Software progress: Milad and Sarah • Remediation: Amir • Conclusion: Milad and Sarah Mike will revise and we will all edit	N/A	**~20 mins**
Gyroscope issues	• Talk to 483 prof • Get advice from Jamal	N/A	**~10 mins**

Next Meeting: March 31, 2014

Meeting Minutes

Meeting number #16

AGENDA

March 31, 2014

7:00-8:00 pm

Purpose of Meeting:

- To discuss remaining tasks and testing schedule

Items for Discussion:

- Remaining tasks
- Balloon test this Wednesday

Meeting Minutes

Meeting number #16

MINUTES

March 31, 2014

7:00-8:00 pm

Work-Order: Progress meeting

Present: Milad Bonakdar, Michael Nguyen, Amir Shamsuddin, Shayan Aziz Beaigi, Sarah Elmasry

Absent: N/A

Minutes submitted by Sarah Elmasry

New business:

TOPIC	OUTCOME					TBD	TIME
Remaining tasks and assigned member	2D	Wifi Re-Connectivity	Sarah	Milad	12th	N/A	**~40 mins**
	2D	Angle restriction	amir	milad/mike	13th		
	2D	Parachute	shayan	Mike	9th		
	1D	Angle compensation	amir	mike	12th		
	3D	Weight reduction	amir	milad	12th		
	2W	Enclosure link to Balloon	shayan	Amir			
	3W	Reel and Tethering reliability	shayan	mike			

	1W	Power Cable	mike	NA			
	3D	Post-Mortem/Minutes	sarah	amir	15th		
	3D	Power point Presentation	amir	sarah	13th		
	1D	Speed selection	milad	amir/sarah	12th		
	2D	Video Playback	sarah	milad	11th		
	2D	Video Recoding 10 minutes	sarah	milad	11th		
	1W	Gyro Intergration	amir	milad			
	1W	Net:Re-usable	shayan	amir			
	1W	recharge battery	Amir	Shayan			
Member schedules	• Sarah and Mike: Busy until the 9th • Milad is busy this week • Amir and Shayan are free to test this weekend • Milad, Amir and Shayan have a final on the 11th					N/A	**~10 mins**
Testing on Wednesday	• Helium will arrive Wednesday morning • Amir and Shayan will find out how much battery will have left on Wednesday morning • Netting will be ready					N/A	**~10 mins**

Next Meeting: TBD