Barone2 Report Week of 5/17/21

Sprint 3 (Spring),

Prepared by Jeremy Germenis

**Executive Summary of Progress:**

In this sprint, the main goals were to finish the fabrication and the inputting of parts onto the fabricated envelope and gondola, as well as finishing the integration of closed loop RC control into a simulated environment. Other goals of the group were to make sure the motors and servos would be able to work when integrated into the system, while also measuring their actual power draw when they are performing their expected functions. However, few of these goals were finished due to having too many hours per person and too many tasks that had been delayed previously. Writing the first sections and outlines of the final report was also done in this sprint, causing many hours to be devoted to writing.

In the mechanical design, only the 3d printing and inflation test were done, as most of the wiring could not be done and many of the other parts were not ready to be added to the actual drone. The 3d parts were printed to specifications and the inflation test showed improvements in the design, but still did not meet estimated drag specifications. Controls for closed loop RC and auxiliary functions were completed, but the entire autonomous function of our drone had to be abandoned due to the lack of the completion of integrating the closed loop RC into the Vrep simulation, while the matlab simulation showed the system would output realistic values within the system requirement range. The PCB also had to be abandoned due to an incorrect footprint and errors while trying to solder wires onto the PCB, meaning the drone’s sensors had to be wired individually. However, some work was done on the system state machine and working the motors and servos with the RC controller, however power tests for the two were not able to be completed on time. Overall, too many tasks were put on each member of the team and some tasks were abandoned in order to complete some of the final tasks on time that would need to be completed by the end of the project.

**Progress made toward acceptance criteria:**

| Task Deliverable/  Acceptance Criteria | Status | Responsible Party | Anticipated Hours | Details |
| --- | --- | --- | --- | --- |

**Mechanical Design:**

| Finish other 3D printing parts | Complete | Dylan, Isaac | 10 | All 3D parts have been printed, although some may need to be reprinted with adjustments such as the camera mounts. |
| --- | --- | --- | --- | --- |
| Attach 3D printed parts to envelope | Incomplete | Dylan, Isaac | 10 | Due to continuing adjustments to the envelope 3D parts have yet to be attached |
| Inflation test of lift bag in envelope with air | Complete | Dylan, Isaac | 5 | Another inflation test was conducted which was successfully able to reduce the height of the envelope without reducing its width. |
| Attach Servo and motor shafts to brackets | Incomplete | Dylan, Isaac | 4 | One Servo and motor were connected for checking if the part was correct, however the electronics side needs to be finished before the rest can be attached. |
| Attach Ultrasonics to Bracket | Incomplete | Dylan | 1 | One ultrasonic has been connected but electronics need to be tested before the rest can be attached. |
| Add Electronics to Gondola | Incomplete | Dylan | 5 | Electronics need to be tested before the rest can be attached. |
| Wire Prototype | Incomplete | Dylan | 10 | Electronics need to be tested before the rest can be attached. |
| Second inflation test of lift bag inside envelope with air | Incomplete | Dylan | 5 | 3D parts need to be attached before |
| Order and pick up helium | Incomplete | Dylan | 3 | Helium will not be picked up until Full system is ready to be tested |
| Do initial RC test at Delaware | Incomplete | Dylan | 10 | System not ready to be tested |
| Start Helium Loss test | Incomplete | Dylan | 3 | System not ready to be tested |

**Drone Simulation:**

| Finish adding noise to sensors in sim | Complete | Isaac | 7 | Noise added to sensors completed by finding documented error in data sheets and placing them over a Gaussian distribution. |
| --- | --- | --- | --- | --- |
| Implement closed loop RC in V-rep | Incomplete | Isaac | 30 | 10 hours of subtasks complete within this task, most of the allotted time in the task was spent in fabrication. |

**Controls Design:**

| Implement and test closed loop RC | Complete | George | 15 | State feedback control implemented with an integral path for disturbance rejection. Works by implementing a pitch roll height regulator with an open loop RC system |
| --- | --- | --- | --- | --- |
| Design autonomous controls | Incomplete | George | 25 | Incomplete. |
| Implement and test autonomous | Incomplete | George | 15 | Incomplete, replied on autonomous design. |
| Test Auxiliary Functions | Complete | George | 15 | Pitch roll error, hover function, take off and landing functions designed and tested in matlab. |
| Design Filters | Incomplete | George | 15 | Filter sensor data to get accurate values |
| Design Estimators | Incomplete | George | 20 | Estimate state based on sensor data |

**Systems Programming:**

| Solder PCB board | Incomplete | Leon | 5 | Failed to do so because some parts didn’t have the right footprint, or were too small to solder by hand, and there were too many mistakes with the first PCB version so we decided to scrap it |
| --- | --- | --- | --- | --- |
| Test PCB for bugs | Incomplete | Leon | 10 | Never got around to it because soldering PCB was a failure |
| Get total system power draw | Incomplete | Leon, Jeremy | 2 | Total system power draw could not be measured due to not completing power draw estimates for servos |
| Finish connecting RC receiver to Raspberry Pi | Complete | Leon | 5 | Raspberry Pi was correctly configured to receive inputs from the remote controller (throttle, yaw, pitch and roll commands) |
| Implement servos and motors to move in four basic directions | Complete | Leon | 10 | PIC32 was configured to control servos and motors in basic directions (up/down, left/right, forwards/backwards) |
| Implement servos and motors to move in any direction | Incomplete | Leon | 10 | Incomplete since a lot of time was spent testing the servos and motors, and we broke multiple parts on multiple occasions which took a long time to either debug or wait for a new one |
| Implement remote control in state machine for PIC32 | Incomplete, in progress (3 hours complete) | Leon | 10 | 3 hours complete: Incomplete since a lot of time was spent testing the servos and motors, and we broke multiple parts on multiple occasions which took a long time to either debug or wait for a new one |
| Implement remote control in state machine for Raspberry Pi | Incomplete, in progress (3 hours complete) | Leon | 10 | 3 hours complete: Incomplete since a lot of time was spent testing the servos and motors, and we broke multiple parts on multiple occasions which took a long time to either debug or wait for a new one |
| Implement Raspberry Pi autonomous control data processing | Incomplete | Leon | 20 | Incomplete since a lot of time was spent testing the servos and motors, and we broke multiple parts on multiple occasions which took a long time to either debug or wait for a new one. Autonomous control in real time is going to be scrapped as we do not have enough time. |
| Add autonomous control to PIC32 state machine | Incomplete | Leon | 10 | Incomplete since a lot of time was spent testing the servos and motors, and we broke multiple parts on multiple occasions which took a long time to either debug or wait for a new one. Autonomous control in real time is going to be scrapped as we do not have enough time. |
| Add autonomous control to Raspberry Pi state machine | Incomplete | Leon | 10 | Incomplete since a lot of time was spent testing the servos and motors, and we broke multiple parts on multiple occasions which took a long time to either debug or wait for a new one. Autonomous control in real time is going to be scrapped as we do not have enough time. |

**PCB Design:**

| Fix V1.9 PCB bugs in V2.0 | Incomplete | Ryan | 20 | V1.9 cannot be implemented with hand soldering tools. V2.0 does not address issues of V1.9 bugs. |
| --- | --- | --- | --- | --- |
| Order V2.0 PCB | Incomplete | Ryan | 1 | V2.0 PCB not ordered since V1.9 PCB is not implemented and tested |
| Order new parts for V2.0 PCB | Incomplete | Ryan | 1 | V2.0 PCB not ordered, no need to order. |
| Implement inductor capacitor circuit for 1.8V, 3.3V, and 5V | Complete | Ryan | 10 | Not needed due to 3.3V and 5V switching regulator breakout boards already having inductor capacitor circuits. |
| Help with Controls and System Programming coding | Incomplete | Ryan | 20 | Did not ask Control and Systems Programming coding needed help. |

**Power Management:**

| Test motor power at different throttles and compare it to estimates | Incomplete  (4 hours complete) | Jeremy | 5 | Motor power was estimated, but not yet compared to estimates. |
| --- | --- | --- | --- | --- |
| Test servo power and compare it to estimates | Incomplete | Jeremy | 3 | Servo power could not be tested by the end of the sprint but was done the day after. |
| Adjust Power budget with tested values | Incomplete | Jeremy | 2 | Power budget could not be adjusted due to incomplete power tests with the servos. |
| Assist Systems Programming with State Machine Coding | Incomplete | Jeremy | 15 | State machine coding was not a focus of this sprint as previously thought, most time with other members was done testing hardware. |

**Other:**

| Writing Considerations of a Buoyant Drone Draft | Incomplete | Dylan | 16 | 12 hours of subtasks complete on subsection outlines but final section has not been outlined |
| --- | --- | --- | --- | --- |
| Write Legal/Safety part of final report | Incomplete | Jeremy | 10 | Only outline of this section was done due to a lack of completed tasks that could go in this session |
| Write Power management section of final report | Complete | Jeremy | 10 | Power management section of the report was written, but will need heavy revision. |
| Write PCB section of final report | Incomplete | Ryan | 10 | Abstract and Chapter 5 outline complete except body paragraphs. |
| Write simulation section of final report | Incomplete | Isaac | 10 | Abstract and Outline completed but first draft has not yet been started. |
| Write systems programming section of final report | Incomplete | Leon | 20 | Not started because a lot of time was spent testing the servos and motors, and we broke multiple parts on multiple occasions which took a long time to either debug or wait for a new one. |
| Group Meetings | Complete | All | 8 | Group met continuously throughout the sprint |
| Hardware Subteam Meetings | Complete | Jeremy, Leon, Ryan | 10 | Hardware team, mostly Leon and Jeremy meeting for hardware tests and power tests |
| Software Subteam Meetings | Complete | George, Dylan, Isaac | 10 | Software subteam meeting to help Isaac and George with coding |

**Calculate sprint velocities:**

| Team Member | Estimated hours of all tasks | Estimated hours of completed tasks | Actual hours worked | Sprint Velocity | Reasoning for members <1 |
| --- | --- | --- | --- | --- | --- |
| Dylan | 100 | 45 | 55 | 0.82 | Many tasks were not able to be completed due to electronics not being ready to add to the full system. I also did not have time to work 100 hours within this two week period due to midterms in other classes. |
| Isaac | 94 | 40 | 50 | 0.8 | Most of the time in this sprint was provided to the fabrication of the prototype. Closed loop RC code was provided in the latter half of the sprint, so time spent in simulation was allotted to the later part of the second week. |
| George | 120 | 48 | 110 | 0.43 | Fell behind, had trouble identifying certain bugs in the simulink design and the integral path took far longer to implement properly than expected. Resulted in incomplete tasks even with most of the hours put in |
| Leon | 130 | 39 | 48 | 0.81 | A lot of time was spent testing the servos and motors, and we broke multiple parts on multiple occasions which took a long time to either debug or wait for a new one. In addition, there is not enough time for autonomous control to be done so no work was done in that. |
| Ryan | 72 | 20 | 23 | 0.87 | V2.0 PCB’s V1.9 bug fixes not implemented in design. V1.9 PCB not soldered due to location restrictions for PCB leader (Ryan) to hand solder himself. Leonid lacked the hand soldering experience and ended scrapping V1.9 and V2.0 PCB. Dev boards for microcontroller and microprocessor wiring diagrams are drawn instead for an alternative approach to meet system level requirements. |
| Jeremy | 63 | 28 | 47 | 0.596 | Power tests with the motor and servos were not completed in time for the end of the sprint due to confusion over the parts needed. However, the power tests were continued and completed shortly after the sprint ended |
| Total | 579 | 220 | 333 | .66 | Most of the team fell behind due to the large number of hours assigned for a two week period, as well as snowballing delays from uncompleted tasks piling up. |

**Product Owner, Teaching Team, Client Feedback:**

| Functionality Demonstrated | Feedback | Team Response |
| --- | --- | --- |
| All 3D parts have been printed, although some may need to be reprinted with adjustments such as the camera mount. | 3D parts have been shown to be able to hold intended parts, with the exception of the camera mount which needs reprinting. The weights also all fit in the weight budget. There is concert that some of the edges may be “sharp” and could be damaging to the balloon | By using hot glue and bubble wrap the edges of the 3D printed parts can be softened to protect the lift bag. The camera mount will be reprinted with more accurate dimensions with a depth that includes an extra few mm to account for the wires coming out of the back. |
| Another inflation test was conducted which was successfully able to reduce the height of the envelope without reducing its width. Which results in a lower expected drag | This Inflation test reduced the expected drag from 68N to 44N however there is now slack in some areas of the envelope that could cause unevenness on propeller placement around the system. | The inflation was used to test the fabrication product as well as recreate an actual flight test without the buoyant factor. The most difficult parts of these tests were securing the balloon within the envelope without the 3D parts tearing the lift bag. |
| Noise added to sensors completed by finding documented error in data sheets and placing them over a Gaussian distribution. | Noise taken from data sheets correctly represented in V-Rep simulation this distribution should be good test data for inputs for testing our control systems | The data will be eventually used to feed inputs into the autonomous functions, but depends highly on the completion of closed loop remote functionality. The demonstration of data distribution will hopefully be able to mimic closer to real life noisy sensors. |
| State feedback control implemented with an integral path for disturbance rejection. Works by implementing a pitch roll height regulator with an open loop RC system | This implementation of the RC closed loop will stop all other functions in order to correct pitch and roll errors. This control method will keep the system very stable based on the matlab simulation. The next phase of testing in V-REP should start ASAP | System responses are well within stable limits as defined in the system technical requirements. The system must be verified in Vrep to ensure stability in a more realistic simulated setting |
| Pitch roll error, hover function, take off and landing functions designed and tested in matlab. | Similar to the RC system the functions demonstrated in matlab appear to be well structured and provide stable and realistic values. This should be tested in V-REP ASAP. | Systems have good response and are stable. The functions need to be converted to c code and tested in Vrep |
| Raspberry Pi was correctly configured to receive inputs from the remote controller (throttle, yaw, pitch and roll commands) | Oscilloscope readings of signals going into Raspberry Pi were observed to vary on high time based on the movement of the controller’s joysticks. This signal is clean and should easily be able to be read and used as an input to control systems | Now that the remote controller inputs are being read by the Raspberry Pi, they will be passed on by the Raspberry Pi to the PIC32 in order to control the servos and motors |
| PIC32 was configured to control servos and motors in basic directions (up/down, left/right, forwards/backwards) | Based on the input signal from the remote control the PWM signal goes to the esc and servos. Power draw was successfully able to be measured in these tests. Although the current values and power were lower than expected which is an overall benefit to the flight time of the system, the question remains as to why the estimates were twice as high as the record values? | More testing and results analysis has to be done to confirm our measurements, and we need to go back and check our calculations for our estimations |

**Possible Sprint Improvements:**

* **Team Improvements**:
  + Too many hours for two week sprint
    - Over assigned in order to try and meet ending timeline
    - Not enough time was spent in the earlier sprints of the project
  + Need to be more critical of slides and Tasks completion
  + Need to delegate tasks more especially to people with less hours
  + Tasks need to be defined better in sprint setup
* **Individual Improvements:** 
  + Dylan-
    - Needs to improve on working on multiple classes worth of work in one day
      * Usually just spends all effort in a day for one class
      * I think it would be more efficient to work on a little bit of each class everyday
  + George-
    - Need to improve slides and presentation
    - Break down tasks into smaller components
  + Isaac-
    - Ask more questions and take more notes
    - Start early in case errors arise
  + Jeremy -
    - Define task completion better during first sprint meeting
    - Justify work more completely when writing the final report
  + Ryan-
    - Check footprint sizes of ordered surface mount devices
    - Design own footprint in Eagle CAD to ensure sizes are the same as data sheet footprint
  + Leon-
    - Get more work done during the day
    - Watch more tutorial videos before attempting to do hands on work like soldering and putting together electronics

**Next Sprint Goals:**

* Dylan-
  + Finalize Envelope shape
  + Finish attaching parts too envelope
  + Add electronics and wire prototype
  + Full system RC test
  + Create slides for design defense
  + First Draft Chapter 3
* George-
  + Retune closed loop controls response for actual drone dimenions
  + Design autonomous commands method
  + design and test autonomous controls response
  + Prepare autonomous controls response to be tested in Vrep
  + Have outlines of Chapter 1 and chapter 7 chapters
* Isaac-
  + Finish implementing closed loop remote control
    - Import code to client program
    - Test and debug
  + Finish implementing autonomous control
    - Import code to client program
    - Test and debug
  + Help with fabrication testing
  + First draft of simulation chapter
* Jeremy-
  + Finish Power Tests with motors and servos
  + Get new power estimates with new modifications to drone and with motors/servo test
  + Help with fabrication and wiring of drone
  + Write more chapters of the final report and revise those i’ve already done
* Ryan-
  + Complete wiring design for V2.0 PCB
  + Prepare slides on PCB failure in final design defense meeting and show how surface mount parts should be ordered in larger footprint for hand soldering
  + Order 1.8V, 3.3V, and 5V switching regulator for servo, sensors array, microcontroller, and microprocessor
  + Finish Section 1 Sensor array chapter
    - All sensors that require I2C protocol with microcontroller
    - GPS sensor requiring UART protocol with microcontroller
    - Microcontroller SPI communication with microprocessor
    - Data telemetry GPIO pin to microprocessor
    - RC receiver GPIO pin to microprocessor
  + Finish Section 2 State Machine Intro
    - Explain how sensor array data determines state machine
  + Finish Section 3 PCB Interface
    - Explain V1.9 design features and failures
    - Explain V2.0 design improvements on V1.9 with switching regulators, trace width improvements
    - Trace width calculation guideline explanation
* Leon-
  + Finish power tests with motors and servos with Jeremy
  + Finish any remaining code that requires the parts to be with me in person
    - State machine for PIC32 and Raspberry Pi
    - System start up procedure with device/sensor checks
  + Connect/solder electronics onto breadboard to be put into gondola
* Team Goals
  + COMPLETE TEST FLIGHT OF PROTOTYPE WITH RC CONTROL
  + Implement closed loop RC and autonomous in simulation
  + Finish outline for all final report chapters

**Meeting Minutes for Spring Sprint 3:**

Sprint 7 Start

Long Flight Time Buoyant Drone April 30, 2021 6:00 PM(PST)

horizontal lineATTENDEES

* Excused absences: N/A
* Unexcused absences: N/A
* Late: N/A

## AGENDA

* Administrative Stuff
* Sprint Reports
* Leon: Still working with the receiver, using C++ experience in other class to switch over with the raspberry pi

6:05

* Jeremy: Will try to test motors next with Leon
  + Else was just working on writing the final report

6:07

* Isaac/Dylan: 3D printed ultrasonic mount
  + Finished envelope sewing, currently working on inflating balloon inside of envelope as a test

6:09

* George: Seeing if servo speed can be inputted into the controls system for better responses

6:10

* Ryan: Catching up with ordering sparkfun parts that were delayed. Digikey is also shipped, waiting for delivery

6:11

* Weight allocation columns have been added for actual weight of components
  + This is to make sure the weight budget is still within limitations
* Sprint report will be finished on friday
* Everyone should have slides to show by friday for TA meeting

6:14

* Planning for writing the final paper
  + Hours will be assigned in sprints to work on writing, should be specific in the section of writing that is assigned instead of hours worked
* Sprint 7 will be started on Friday
  + Goals should not be defined per person, but related to the areas that need work
  + SCRUM master will be Jeremy
* Define Goals (General, see where we need dependencies etc) 6:20
  + Hardware
    - Finish fabrication of PCB design and test bugs and power usage
    - Finish drone prototype
    - Test RC on drone prototype
  + Software
    - Autonomous and remote control implementation in sim
    - Finish remote control implementation in software
    - Implement autonomous control in software and test in simulation
    - Implement closed loop remote control in software and test in simulation
    - Design and program the state machine
    - Fix V1.9 PCB bugs in V2.0
    - Order V2.0 PCB
    - Implement inductor capacitor circuit design for 1.8V, 3.3V and 5V rails in V2.0 PCB
  + Miscellaneous
    - Work on design report
* Define End Date 6:32
  + Sprint end: talk to tanner about sprint goals before deciding on end date
* Tasks (Specific) List Requirement ID if available. Time estimate
  + Leon (**130 hours**) - 6:49
    - Assemble first PCB board with all components and test for bugs (**15 hours**)
      * Solder PCB board (5 hours)
      * Test for bugs (10 hours)
    - Get total system power draw (**2 hours)**
    - Finish remote control implementation (**15 hours**)
      * Finish connecting RC receiver to Raspberry Pi (5 hours)
      * Implement servos and motors to move in four basic directions (10 hours)
      * Implement servos and motors to move in any direction (10 hours)
    - Implement system state machine with remote control functionality (**20 hours**)
      * Implement state machine for PIC32 (10 hours)
      * Implement state machine for Raspberry Pi (10 hours)
    - Implement autonomous control (**20 hours**)
      * Implement Raspberry Pi data processing (20 hours)
    - Add autonomous control functionality to system state machine (**20 hours**)
      * Add autonomous control to PIC32 state machine (10 hours)
      * Add autonomous control to autonomous control state machine (10 hours)
    - Write sections for report (**20 hours**)
      * Sensors programming (5 hours)
      * Remote control implementation (5 hours)
      * Autonomous control implementation (5 hours)
      * System state machine (5 hours)
    - Group meetings (**8 hours**)
    - Sub-team meetings (**10 hours**)
  + Jeremy (63 hours) - 6:51
    - Test Motor Power at different throttles and compare it to estimates(5 hours)
    - Test Servo Power and compare it to estimates(3 hours)
    - Adjust Power budget with tested power values(2 hours)
    - Group meetings (8 hours)
    - Sub-team meetings (10 hours)
    - Writing Final Report Chapter 7, (10 hours)
    - Write Final Report Chapter 12, legal and safety concerns(10 hours)
    - Help Leon with state machine coding(15 hours)
  + Isaac (79 hours) - 6:53
    - Finish adding noise to sensors in sim (7 hours)
    - Implement closed loop Finishing V-rep (25 hours)
    - Finish other 3D printing parts (10 hours)
    - Attach 3D printed parts to envelope (10 hours)
    - Inflation test of lift bag inside envelope with air (5 hours)
    - Attach servo and motor shafts to brackets (4 hours)
    - Writing simulation section (21 hours)
    - Group meetings (8 hours)
    - Sub-team meetings (10 hours)
  + Dylan (100 hours) - 6:53
    - Finish other 3D printing parts (10 hours)
    - Attach 3D printed parts to envelope (10 hours)
    - Inflation test of lift bag inside envelope with air (5 hours)
    - Attach servo and motor shafts to brackets (4 hours)
    - Add ultrasonics to bracket (1 hour)
    - Add electronics to gondola (5 hours)
    - Wire prototype (10 hours)
    - Second Inflation test of lift bag inside envelope with air (5 hours)
    - Order helium and pick up helium (3 hours)
    - Do initial RC test at Delaware (10 hours)
    - Start Helium loss test (3 hours)
    - Writing Considerations of a buoyant drone(16 hours)
      * Intro
      * General goals
      * Implications of a buoyant drone
      * General design overview
    - Group meetings (8 hours)
    - Sub-team meetings (10 hours)
  + George () - 6:57
    - Implement and test closed loop RC 15
    - Design autonomous controls 25
    - Implement and test autonomous 15
    - Test auxiliary functions 15
    - Design filters 15
    - Design estimators 20
  + Ryan (72 hours) - 7:01
    - Fix V1.9 PCB bugs in V2.0 (20 hours)
    - Order V2.0 PCB (1 hour)
    - Order new parts for V2.0 (1 hour)
    - Implement Inductor Capacitor circuit for 1.8V, 3.3V, and 5V (10 hour)
    - Help coding with George and Leonid (20 hours)
    - Sub-team meeting(10 hours)
    - Final Report (10 hours)

Etc: 7:07

* Writing sprint 6 report

Meeting End: 7:40

**4/29/21 7:00 - 7:12pm**

* Leon: Sprint report will be done by tomorrow’s meeting

7:02

* Jeremy: Working on writing final report and slides
  + Also will be testing servo power with Leon

7:03

* Dylan: 2 Inflation tests were done
  + 2nd test was done to see circumference of balloon
    - Balloon itself is off a little bit to shorten top circumference
    - Lift bag has a small hole, another has been ordered
  + Need to try to get internal support out of the envelope

7:07

* George: Unable to work today due to other work

7:08

* Ryan: Solder has been delivered, allowing Leon to be able to Solder onto the PCB board

7:12 END

**4/30/21 4:00 - 7:12pm**

Meeting with TA Tanner

* Use ADS for trace width calculation to ensure maximum power transfer from trace in PCB
  + Parameter can also be found from boardhouse

4:05

* Switching regulator noise can be eliminated, but it is unknown as to if the noise would actually affect the components that it is powering

4:10

* Last design review will be a design “defense” where we have to defend our design choices

4:12

* Design considerations when sizing the envelope needs to be put on the slide

4:18

* Tela likes bullet points while petersen does not

4:24

* Specify noise is actually the voltage ripple
* Coulomb counting will be a better way to determine battery percentage
  + Depth of discharge can be used with this

4:40

* Debating on whether to introduce the slides of controls, because there are many parts in the greater result that is found

4:47

* Last sprint doesn’t have to be all writing, some groups may need extra time to work on project
* Paper is due on June 7th

4:52

* If tasks need to be split up, they can be assigned with their hours to other people

4:56

* Milestones that need to be done before the quarter are testing the 1st iteration and completing the 2nd iteration

5:01

* Soldering the board together should focus on making sure everything is powered
  + Then you can worry about everything else
  + Also take time soldering the board

5:10

Sprint Reports:

* Leon: Did some work coding and finished his part for the sprint report

5:13

* Jeremy: Finished up slides and will be writing more for the final report tonight

5:14

* Dylan/Isaac: Need to put work into other classes due to putting them off for fabrication
  + However, they did finish the inflation test

5:15

* George: Made slides
  + Now working on how to do autonomous controller, what to feed it for the autonomous functions

5:16

* Ryan: Sparkfun is on its way, needs to work on slides

5:17

* Need to rearrange first couple of slides to integrate the work shown more to not make it individualized

5:18

* Sprint starts today
* Previous sprint report will be done after the product owner feedback is done
* Gantt chart and slide reviews will be done on Monday

**5/1/21 7:00 - 7:09pm**

* Leon: Still writing code on Raspberry Pi, getting ready to solder at least power components onto PCB

7:02

* Isaac: Reviewed V-REP code for noise analysis

7:03

* Dylan: started another print, backplates for servo brackets came out well.
* Weather balloon should arrive on wednesday

7:05

* George: Found different way to calculate gains so he is exploring it to try to reduce overshoot on the height regulator

7:08

* Ryan: Checked shipment of Sparkfun, delivery May 4th

7:09 END

**5/2/21 7:00 - 7:09pm**

* Sprint Updates:
* Leon: Receiver output is able to be read with the protocol
  + Now needs to parse the data on the raspberry pi

7:02

* Jeremy: Working on more writing for final report

7:03

* Isaac: Working on adding torques one meter away from the center of the balloon

7:04

* Dylan: Stuck with other class work, Feedback on the sprint report should be done by the meeting tomorrow

7:05

* George: Working with augmenting the matrices in order to do integrals on them

7:06

* Ryan: Has been stuck with other class work

7:07

* ETC: Finish slides by Tuesday for submission for review
* Soldering tests should be done soon for testing of the PCB board

7:08 END

**5/3/21 6:00 - 7:03pm**

Sprint Updates:

* Leon: Finished with testing the RC receiver protocol, will be working on different directions next

6:01

* Isaac: Coding Vrep closed loop RC conversion

6:02

* Jeremy: Working on writing, also sticking with RC receiver method for measuring battery

6:03

* Dylan: New lift bag came in, propellers were lost in the delivery, new ones were ordered

6:04

* George: Baskin funding will be sent to Dylan
  + Overshoot for height control is fixed, will be reduced enough for controls

6:05

* Ryan: Will work on slides for Friday

6:06

* Feedback was delayed for the sprint report, will be done by tomorrow
* Slides should also be done tomorrow
* Another inflation test will be done tomorrow for the new balloon

6:07

Gantt Chart Updates

* RC closed loop control complete
* Testing motors and servos delayed to this friday due to delivery issues

6:14

* Updating design review intro slides to be less individualized and a general overview of the project

6:20

* Working on milestones to include on the first slides

6:35

* Everyone should work on notebooks
* George has another presentation for controls

7:02

* Tomorrow’s workshop is CIED workshop and modified office hours
* Jeremy and Isaac can attend

7:03 END

**5/4/21 7:00 - 7:57pm**

* Sprint Updates:
* Leon: Working on coding basic maneuvers, forward, turning, and backwards

7:02

* Jeremy/Isaac: Unable to write much today, went to workshop and identified two presentations we are supposed to do do

7:05

* Dylan: Will be going to campus to do 3d printing after the meeting

7:06

* George: Working on using augmented matrices to get new gains, error causing destabilization is being investigated

7:07

* Ryan: Working on finishing slides and trace widths

7:08

* Going over response to product owner feedback in final report

7:20

* Finalizing executive summary

7:28

* Team Goals
  + Report writing- First drafts of five chapters to be completed.
  + Put together complete drone
  + Attempt first drone flight

7:33

* Submitting slides and sprint report tonight

7:35

* Fixing slides to be integrated between certain team members
* Ryan/Jeremy: Power
* Dylan/Leon: Hardware & fabrication
* George/Isaac: Software and Controls

7:57 END

**5/5/21 6:00 - 7:03pm**

* Sprint Updates:
* Leon: Working on coding for direction procedure
  + Tomorrow will do motor/propeller and servo test

6:04

* Jeremy: Unable to work on writing, but did fix slides
  + Fixed voltage divider for RC receiver after miscalculation

6:05

* Isaac: Inflation test with balloon with sewing attached
  + Helped Dylan with 3d printing the gondola

6:06

* Dylan: Printing Gondola, ran out of filament at 98% complete
  + Should be fine, but will order more filament

6:11

* George/Ryan: Unable to do much work due to midterms

6:14

* Working on comments based on the slides by Tela
* Individual work on slides and other work

7:03 END

**5/6/21 7:00 - 8:45pm**

* Sprint Updates:
* Leon: Working on more coding, no slides made yet
  + Found missing propellers when organizing packages
  + Also was weighing materials for weight allocation

7:06

* Jeremy: Will be done with Ch7 draft in the next few days and will work on other chapter after

7:08

* Isaac: Starting on writing his chapter in the final report
  + Should make a slide for sim or inflation test

7:09

* Dylan: Got new filament for Printer, more parts will be printed over the weekend

7:10

* George: Having issues with the saturator, looking for errors
  + Got 500 dollars for funding from Porter

7:11

* Ryan: Also should start on writing his chapter in the final report

7:13

* Individual slide work before practice presentation

8:02

* Practice Run-through of design ⁹review

8:45 END

**5/9/21 7:00 - 7:14pm**

* Sprint Report
* Leon: Working on code for basic movements of servos

7:04

* Jeremy: Meeting with leon to test motors and other parts he has
  + Also responded to feedback from George on Chapter 7 outline
  + Lastly was looking at voltage alarms as a replacement

7:08

* Isaac: Started chapter outline

7:09

* Dylan: Read some chapter outlines and gave feedback
  + Need to make sure servo brackets are right size to fit servo

7:10

* George: doing the estimators, and making the matrices for autonomous control, but haven't figure out how to approach the controls response yet

7:11

* Ryan: Will get started on chapter outline

7:12

* This sprint will end on the 14th, this Friday

7:14 END

Peer Review meeting

Long Flight Time Buoyant Drone 5/10/2021 6:00 PM -(PST)

horizontal lineATTENDEES

* Excused absences:
* Unexcused absences:
* Tardy:Ryan

## AGENDA

* **Gantt Chart Updates:** 6:03
  + RC Control basic commands 85% done
  + Closed loop RC control in Matlab is complete
  + Testing motors and servos 10% done
* **Check in:** 6:11
  + Jeremy/Leon: Tried to test motor and servo power with Jeremy but didn’t have the necessary materials

6:14

* + Isaac: Working on his own chapter outline

6:15

* + Dylan: Tried to 3d print more parts but wasn’t able to get it working

6:16

* + George: Needs to give Isaac RC code to put in the sprint

6:17

* + Ryan: Started on Chapter 5 outline and posted for review by team
* **Feedback:** Each person will receive feedback from each of the team members and themselves pros and cons, this should be the same feedback you gave on the evals. **BE HONEST**

**6:19**

* + Dylan
    - Feels like he is doing well in the design reviews, staying consistent in the team meetings
    - More mistakes usually happen when things are rushed, has been needing more help with his work
    - Needs to be more proactive in scheduling
    - Putting in more time than most of the team, but needs to watch overconfidence in 3d printing especially
    - Has been working consistently in fabrication over the last sprint
    - Has been getting more proactive in encouraging peer-review

6:27

* + George
    - Doing better on the technical side, but more work needs to be done
    - Making effort to bring the rest of the team up to speed with controls
    - Giving more feedback but also trying to be careful not to be too aggressive
    - Did very well in the last design review, spending a ton of hours on work

6:35

* + Isaac
    - Feels like it is his slowest sprint, could have done more with simulations but it didn’t work out
    - Has been helping Dylan with fabrication, so could not work on other things
    - Got better at presenting his own work
    - Still quiet in the meetings
    - Overall improved since the last sprint with making sure work is reviewed

6:42

* + Jeremy
    - Didn’t have as much to do until now, until in person testing
    - Didn’t put enough thought into design considerations
    - Online environment has been hard, should ask for help more
    - Needs to work on wording and presentation skills
    - Offers help to other people, finishes work very quickly
    - Good at looking for tasks, and has done the most work for writing
    - Be more careful with calculations and design considerations
    - Take feedback better and incorporate it better into work

6:54

* + Ryan
    - Little work, so needs to ask for more work to do from other members since shipping delays have been occurring
    - Time delays due to time zones are still a trouble, since he is not awake at the same time as most of the team
    - Can focus more on writing as being proactive, can research or write the final report if more work needs to be done
    - Has been a little late to some meetings
    - Some oversights with shipping and PCB have been issues

7:02

* + Leon
    - Haven’t had much to show since he has been held back with the receiver work
    - Will be working more with Jeremy and he can help out with some work
    - Has been doing a lot of work and communicating trying to keep up with the work he is doing
    - Should present work to the team more for review
    - Has been helping other team members as well with his own work
    - Last design review was his best since he was able to describe his own work very well
    - Can ask the team more for help in a video call if some hardware issue comes up
    - State Machine/Flow chart also needs to be redone
* **Group discussion:** How we can improve as a team, what changes should we make to the team, what should our workflow look like going forward.

7:12

* + Was kinda burnt out when it comes to reviewing slides
  + Team is getting burnt out overall, need to finish strong
  + Discord has been being used more effectively with peer review and TA help
    - Peer review needs more improvements
  + Gantt Chart has been being used well
  + Trello is very far behind
  + Try to meet in person with whoever is available, since the team is divided by area
  + Report drafts need to be updated since they all need to be the same format
    - Outlines need to be done first and reviewed before actually writing
* **Individual Improvement:** Everyone says one or two things that they are going to improve on before the next design review.

7:21

* + Dylan
    - Ask for help earlier don't be overconfident in everything(expect mistakes)
    - Don't panic/rush when issues arise

7:24

* + George
    - Get better at math
    - Be more forward in pointing out errors/mistakes but make sure to be respectful

7:25

* + Isaac
    - Participate more on critiquing other people’s work
    - Spend more time in the beginning of the week

7:26

* + Jeremy
    - Work more in-person with Leon, making effective power tests for the components available
    - When writing, plan ahead and do a good outline before trying to write

7:27

* + Ryan
    - Ask for help when no tasks are at hand, be proactive about getting tasks from others
    - Show up on time to team meetings

7:28

* + Leon
    - Need to update team with the work I’m doing, especially this week with so much to do
    - Ask for more help, especially with any hardware connections

Meeting End: 7:30 PM

**5/11/21 7:00 - 7:10pm**

* Jeremy: Working on power switch implementation
  + Also working on Ch11 outline

7:01

* Isaac: Updating Outline and code for closed loop RC

7:03

* Dylan: Mechanical part is having issues
  + Trying to fix the 3d printer, thermistor is broken
  + Other parts will need to be printed without Nylon

7:05

* Leon: Had midterm today, couldn’t work

7:06

* George: Made starting slides for presentation slides
  + Also gave feedback on some chapters from other members
  + Also changing control components back into commands for simulation

7:07

* Ryan: Worked on outline for Chapter 5, abstract is done

7:08

* Work on outlines and chapters when there is nothing to do, however other tasks relating to the project takes priority
* Tomorrow, we can go through slides for the presentation and also peer review outlines that have been drafted
* Jeremy, Leon, and Dylan will be meeting tomorrow in person to do hardware work

7:10 END

**5/12/21 6:00 - 7:32pm**

* Jeremy/Leon/Dylan: Got the motor with propellers working with the RC controller
  + Also tested servos with a load working
  + Next test will get thrust capabilities of motor and propeller depending on throttle and also testing the power requirements per throttle bracket
  + Servo brackets could not fit with the wire and the servo
    - Servo shaft does fit with the servo, but had the wrong size to screw the motor onto

6:10

* Isaac: Running RC code in simulation, also finished outline of chapter

6:11

* George: Added converter to turn forces from controller into servo angles and throttles
  + Gave feedback on some chapters of the writing, also made a list of common writing errors we were making

6:12

* Ryan: Working on slides
  + Also applied switching regulators to PCB

6:13

* Smaller nylon filament ordered for fabrication, should be all printed by the end of the sprint

6:15

* Looking at pitch presentation slides to turn in for the pitch event

6:50

* Review of 6 chapters that have been worked on by each of the 6 team members

7:30

* Soldering should be done as soon as solder is fixed, since oxidation causes issues with current solder.

7:32 END

**5/13/21 7:04 - 7:10pm**

Jeremy excused, internet issues and ROTC emergency

* Leon:
  + Bought new solder tip and flux, about to assemble PCB

7:04

* Isaac:
  + Looking for way to convert Lua to C
  + Looking for remote api for vrep

7:05

* Dylan:
  + Set up new printer with new head
  + Printed gondola feet
  + Working on servo brackets

7:06

* George:
  + Trying to figure out best way to implement autonomous control for drone

7:07

* Ryan:
  + Implemented pinout for switching regulators on PCB
  + Rearranged surface mount for coaxial cable for GPS on PCB

7:08

* Other:
  + Got approval from Jonathan to use picture
  + Try to finalize slides with Tanner tomorrow

7:10 END

**5/14/21 5:50 - 7:49pm**

Sprint Reports

* Leon: PCB soldering had issues, breakout boards will have to be used or 1-2 layer PCBs instead of current PCB and use jumper wires

5:54

* Jeremy: Will be doing a power test with Leon tomorrow in the late afternoon

5:55

* Isaac: Looking at remote control into simulation code, Matlab installed for better transitions
  + Closed loop RC in simulation is one week out

5:57

* Dylan: Every 3d part is now printed, some may need to be reprinted if dimensions do not match up

6:00

* George: Working on idea hub application

6:01

* Ryan: PCB soldering isn’t available anymore, due to issues, will have to decide fixes with breakout boards, including if any need to be printed.

Application:

* Worked on Idea-hub application and slides

7:49 END

Sprint 7 Conclusion Meeting

Long Flight Time Buoyant Drone 5/15/2021 7:00 - 8:10 TIME(PST)

horizontal lineATTENDEES

* Excused absences: v
* Unexcused absences:

## AGENDA

**Sprint progress: 7:00**

* Leon/Jeremy: Able to verify voltage alarm working with the battery
  + Did a thrust test, 16% of the total thrust is the max estimated value needed for drone operation
    - Also burnt out one arm of the ESC, new one was ordered but the old one can still be used for testing
  + Power test will be done tomorrow for the thrust

7:05

* Dylan:
  + Did work on Chapter 2 outline
    - Worked on general design overview outline

7:06

* Isaac:
  + Spent the day traveling

7:07

* George:
  + Started work on redoing introduction of paper
  + Researching ways to give commands to autonomous

7:09

* Ryan:
  + Ordered pressure sensor for helium balloon
  + Worked on Chapter 5 outline
* **Review of Progress**: 7:10
  + Leon (**130 hours**) - 7:11
    - Assemble first PCB board with all components and test for bugs (**15 hours**)
      * Solder PCB board (5 hours)
        + Incomplete
        + Some parts didn’t have the right footprint, or were too small to solder by hand, and there were too many mistakes with the first PCB version so we decided to scrap it
        + Spent 2 hours on it
      * Test for bugs (10 hours)
        + Incomplete
        + First PCB was scrapped
    - Get total system power draw (**2 hours)**
      * Incomplete
      * Drone wasn’t constructed in time
    - Finish remote control implementation (**15 hours**)
      * Finish connecting RC receiver to Raspberry Pi (5 hours)
        + Complete
        + Spent 5 hours on it
      * Implement servos and motors to move in four basic directions (10 hours)
        + Complete
        + Not tested with all servos and motors yet
        + Spent 15 hours on it
      * Implement servos and motors to move in any direction (10 hours)
        + Incomplete
        + Not sure whether this will still have time to be implemented with the time left
    - Implement system state machine with remote control functionality (**20 hours**)
      * Implement state machine for PIC32 (10 hours)
        + Incomplete
        + Fixed theoretical state machine, but not implemented in code yet
        + Spent 3 hours on it
      * Implement state machine for Raspberry Pi (10 hours)
        + Incomplete
        + Fixed theoretical state machine, but not implemented in code yet
        + Spent 3 hours on it
    - Implement autonomous control (**20 hours**)
      * Implement Raspberry Pi data processing (20 hours)
        + Incomplete
        + Autonomous control in real time may be scrapped since not enough time left
    - Add autonomous control functionality to system state machine (**20 hours**)
      * Add autonomous control to PIC32 state machine (10 hours)
        + Incomplete
        + Autonomous control in real time may be scrapped since not enough time left
      * Add autonomous control to autonomous control state machine (10 hours)
        + Incomplete
        + Autonomous control in real time may be scrapped since not enough time left
    - Write sections for report (**20 hours**)
      * Sensors programming (5 hours)
        + Incomplete
        + Didn’t get around to it
      * Remote control implementation (5 hours)
        + Incomplete
        + Didn’t get around to it
      * Autonomous control implementation (5 hours)
        + Incomplete
        + Didn’t get around to it
      * System state machine (5 hours)
        + Incomplete
        + Didn’t get around to it
    - Group meetings (**8 hours**)
      * Complete
      * Spent 8 hours on it
    - Sub-team meetings (**10 hours**)
      * Complete
      * Spent 12 hours on it
  + Jeremy (63 hours) - 7:18 (28/63 hrs Complete)
    - Test Motor Power at different throttles and compare it to estimates(5 hours)
      * Incomplete, only need to compare it to estimates
    - Test Servo Power and compare it to estimates(3 hours)
      * Incomplete, will be done with power test tomorrow
    - Adjust Power budget with tested power values(2 hours)
      * Incomplete, tests not done
    - Group meetings (8 hours)
      * Complete
    - Sub-team meetings (10 hours)
      * Complete
    - Writing Final Report Chapter 7, (10 hours)
      * Complete, first draft completed, needs revision
    - Write Final Report Chapter 11, legal and safety concerns(10 hours)
      * Incomplete, only outline done since no legal/safety tasks have been done
    - Help Leon with state machine coding(15 hours)
      * Incomplete, delayed state machine work, should be more specific with tasks like this in the future
  + Isaac (84 hours) - 7:21
    - Finish adding noise to sensors in sim (7 hours)
      * Complete: normal distribution added to GPS, IMU, barometer, ultrasonic
    - Implement closed loop RC in V-rep (30 hours)
      * Find a way to interface V-rep simulation with remote API that takes in C code (10 hours)
        + Complete: Legacy based API found to be able to support C code implementation
      * Write remote control code into client program to run server commands to V-rep (10 hours)
        + Incomplete: starting to import code into client side of sim (VS Code)
      * Debug and Test (10 hours)
        + Incomplete
    - Finish other 3D printing parts (10 hours)
      * Complete. 3d parts fits mounts and electronic components
    - Attach 3D printed parts to envelope (10 hours)
      * Incomplete
    - Inflation test of lift bag inside envelope with air (5 hours)
      * Complete: inflation test with adjusted envelope conducted
    - Attach servo and motor shafts to brackets (4 hours)
      * Incomplete: but it was tested and servos fit.
    - Writing simulation section (21 hours)
      * Incomplete: Outline and Abstract first draft written
    - Group meetings (8 hours)
    - Sub-team meetings (10 hours)
  + Dylan (100 hours) - 7:27
    - Finish other 3D printing parts (10 hours)
      * Complete: some parts may be reprinted for higher quality
    - Attach 3D printed parts to envelope (10 hours)
      * Incomplete
    - Inflation test of lift bag inside envelope with air (5 hours)
      * Complete: inflation test with adjusted envelope conducted
    - Attach servo and motor shafts to brackets (4 hours)
      * Incomplete: but it was tested and servos fit brackets
    - Add ultrasonics to bracket (1 hour)
      * Incomplete: only one attached for testing, waiting for electronics to be ready to implement
    - Add electronics to gondola (5 hours)
      * incomplete : electronics still in testing phase
    - Wire prototype (10 hours)
      * incomplete : electronics still in testing phase
    - Second Inflation test of lift bag inside envelope with air (5 hours)
      * Incomplete 3D parts not attached
    - Order helium and pick up helium (3 hours)
      * Incomplete: not ready for helium testing
    - Do initial RC test at Delaware (10 hours)
      * Incomplete: not ready for testing
    - Start Helium loss test (3 hours)
      * Incomplete: not ready for testing
    - Writing Considerations of a buoyant drone draft **(16 hours)**
      * Intro (4) Complete
      * General goals (4) Complete
      * Implications of a buoyant drone (4) Complete
      * General design overview (4) Incomplete: needs for filling out to be finished draft
    - Group meetings (8 hours)
    - Sub-team meetings (10 hours)
  + George (105 hours) - 7:31
    - Implement and test closed loop RC (15 hours).
      * Complete. Tests in Matlab show responses within design requirements, and was converted To C for vrep sim and for the onboard system
    - Design autonomous controls (25 hours)
      * Incomplete. Should have been broken Down into Subtasks. Plant definition Complete and will use similar state feedback loop with an integral path as the closed loop RC, but method of planning the drone path has not been implemented
    - Implement and test autonomous (15 hours)
      * Incomplete, retired autonomous controls design to complete
    - Test auxiliary functions (15 hours)
      * Test for large angle error and autonomous take and landing. Results tested in Matlab and remain in design requirements. Converted to C for vrep simulation.
    - Design filters (15 hours)
      * Incomplete, need to determine an autonomous method to determine which filters are needed and how to implement them.
    - Design estimators (20 hours)
      * Incomplete. Currently only using pitch and roll estimators, but has not been tested in conjunction with controls response. Shod have broken down into subtasks
  + Ryan (72 hours) - 7:35
    - Fix V1.9 PCB bugs in V2.0 (20 hours)
      * Incomplete: V1.9 scrapped due to footprint of electronics being too small and inexperience in hand soldering to test out V1.9 board. V2.0 will continue to be designed.
    - Order V2.0 PCB (1 hour)
      * Incomplete: V1.9 bugs not fixed as stated above. V2.0 PCB will not be ordered due to time constraints
    - Order new parts for V2.0 (1 hour)
      * Incomplete: V2.0 parts will not be ordered as V2.0 PCB will only be designed but not implemented
    - Implement Inductor Capacitor circuit for 1.8V, 3.3V, and 5V (10 hour)
      * Complete: Implemented in V2.0 PCB, inductors and capacitors are not needed as all sensors can tolerate the noise generated by the switching regulators.
    - Help coding with George and Leonid (20 hours)
      * Incomplete: Task was too vague and no task was asked from Ryan to help with George or Leonid.
    - Sub-team meeting(10 hours)
    - Final Report (10 hours)
* **Team Improvements**: 7:45
  + Too many hours for two week sprint
    - Over assigned in order to try and meet ending timeline
    - Not enough time was spent in the earlier sprints of the project
  + Need to be more critical of slides and Tasks completion
  + Need to delegate tasks more especially to people with less hours
  + Tasks need to be defined better in sprint setup
* **Individual Improvements: 7:48**
  + Dylan- 7:49
    - Needs to improve on working on multiple classes worth of work in one day
      * Usually just spends all effort in a day for one class
      * I think it would be more efficient to work on a little bit of each class everyday
  + George- 7:50
    - Need to improve slides and presentation
    - Break down tasks into smaller components
  + Isaac- 7:51
    - Ask more questions and take more notes
    - Start early in case errors arise
  + Jeremy - 7:52
    - Define task completion better during first sprint meeting
    - Justify work more completely when writing the final report
  + Ryan- 7:53
    - Check footprint sizes of ordered surface mount devices
    - Design own footprint in Eagle CAD to ensure sizes are the same as data sheet footprint
  + Leon- 7:54
    - Get more work done during the day
    - Watch more tutorial videos before attempting to do hands on work like soldering and putting together electronics
* **Next Goals**: 7:55
  + Dylan- 7:55
    - Finalize Envelope shape
    - Finish attaching parts too envelope
    - Add electronics and wire prototype
    - Full system RC test
    - Create slides for design defense
    - First Draft Chapter 3
  + George- 7:56
    - Retune closed loop controls response for actual drone dimenions
    - Design autonomous commands method
    - design and test autonomous controls response
    - Prepare autonomous controls response to be tested in Vrep
    - Have outlines of Chapter 1 and chapter 7 chapters
  + Isaac- 7:57
    - Finish implementing closed loop remote control
      * Import code to client program
      * Test and debug
    - Finish implementing autonomous control
      * Import code to client program
      * Test and debug
    - Help with fabrication testing
    - First draft of simulation chapter
  + Jeremy- 7:58
    - Finish Power Tests with motors and servos
    - Get new power estimates with new modifications to drone and with motors/servo test
    - Help with fabrication and wiring of drone
    - Write more chapters of the final report and revise those i’ve already done
  + Ryan- 7:59
    - Complete wiring design for V2.0 PCB
    - Prepare slides on PCB failure in final design defense meeting and show how surface mount parts should be ordered in larger footprint for hand soldering
    - Order 1.8V, 3.3V, and 5V switching regulator for servo, sensors array, microcontroller, and microprocessor
    - Finish Section 1 Sensor array chapter
      * All sensors that require I2C protocol with microcontroller
      * GPS sensor requiring UART protocol with microcontroller
      * Microcontroller SPI communication with microprocessor
      * Data telemetry GPIO pin to microprocessor
      * RC receiver GPIO pin to microprocessor
    - Finish Section 2 State Machine Intro
      * Explain how sensor array data determines state machine
    - Finish Section 3 PCB Interface
      * Explain V1.9 design features and failures
      * Explain V2.0 design improvements on V1.9 with switching regulators, trace width improvements
      * Trace width calculation guideline explanation
  + Leon- 8:00
    - Finish power tests with motors and servos with Jeremy
    - Finish any remaining code that requires the parts to be with me in person
      * State machine for PIC32 and Raspberry Pi
      * System start up procedure with device/sensor checks
    - Connect/solder electronics onto breadboard to be put into gondola
  + Team Goals 8:06
    - COMPLETE TEST FLIGHT OF PROTOTYPE WITH RC CONTROL
    - Implement closed loop RC and autonomous in simulation
    - Finish outline for all final report chapters
* **Other Business** - 8:07
  + Contact Mircea again
  + Keep using trello

Meeting End: 8:10