Barone2 Report Week of 1/31/21

Sprint 2,

Prepared by Jeremy Germenis

**Executive Summary of Progress:**

The main focus of this sprint was the creation of the CAD model, Vrep simulation environment, and finally the control system response for the drone. Other progress was made in finalizing the parts needed for the drone, such as the microcontroller, microprocessor, and sensors. In addition, the implementation of the PCB design required for the drone’s function was done. The power budget was worked on as well, but requires more review of the datasheets for the parts that are not finalized.

The parts of the sprint that were completed were the first CAD model draft, as well as the addition of the CAD model into a simulation environment. The programming approach that involved the creation of an RC system response for the drone’s functions was also completed but requires further testing with regards to the autonomous responses of the drone. The first PCB design was completed with all parts besides the camera and pressure sensors. Finally, the simulation of power draw was not able to be completed due to the absence of the PCB design before this sprint.

**Progress made toward acceptance criteria:**

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

**Order Initial Parts:**

| Ordered microcontroller, microprocessor, and IMU, ultrasonic, barometric, and GPS sensors | Finished | Leonid | 3 | Created a chart to compare each individual component specs with similar products from the same company or competitors. After this, I chose which part was most appropriate for the project |
| --- | --- | --- | --- | --- |

**CAD Design:**

| Create First Draft CAD | Finished | Dylan | 15 | Created a rough first draft CAD model representing the basic layout of the Barone. It includes all major features in proper locations. Unique attachments were designed small enough to be 3D printed |
| --- | --- | --- | --- | --- |

**Drone Simulation:**

| Created Simulation Environment and Integrated CAD Model into the Simulation | Finished | Isaac | 15 | Worked on adding objects into the V-rep simulation and writing temporary code in order to allow the parts to function properly. Most of this time was spent in learning the functions of V-rep and how the simulator operates in conjunction with the provided objects. |
| --- | --- | --- | --- | --- |

**Controls Design:**

| Decide Programming Approach | Finished | George | 5 | Determine the method on how the control system should be implemented.  Decided on writing in C libraries to be called on in the default Arduino language since it is set up to work with the board already and has sensor libraries set up. |
| --- | --- | --- | --- | --- |
| Create an RC system response | Needs more Testing | George | 15 | Designed and wrote a C function to control the angle of the motors in response to user input. Complete but should add autonomous functionality to help drivers in future. |

**PCB Design:**

| Create first PCB design | Finished | Ryan | 8 | Finished first schematic and board design. All but cameras, and pressure sensors are integrated in PCB design. Raspberry Pi compute module, |
| --- | --- | --- | --- | --- |

**Power Management:**

| Get Power Draw of all BoM Parts | In Progress | Jeremy | 5 | All ordered and finalized bill of materials parts have been added to the power budget, other unfinalized parts still need to be added before ordering |
| --- | --- | --- | --- | --- |

**Calculate sprint velocities:**

| Velocities | Estimated Hours | Total Hours | Velocity (Estimated hr./ Total hr.) | Description (Reasoning for velocities < 1 |
| --- | --- | --- | --- | --- |
| **Team** | 60 | 73 | .82 | Total work is skewed towards those working with design software |
| Dylan | 15 | 20 | .75 | Was less comfortable with solidworks then expected, especially with spherical shapes, took extra time to relearn software |
| Ryan | 8 | 8 | 1 |  |
| Jeremy | 8 | 5 | 1.6 |  |
| Isaac | 6 | 15 | .4 | Estimation time was lower than expected, but most of the time spent on V-rep was done in learning how the simulator operates. |
| George | 20 | 25 | 0.8 | Misjudged time needed to decide on approach, and learned he is rusty on C languages and needed to review more than expected |
| Leonid | 3 | 10 | 0.33 | Thought I knew what microcontroller, microprocessor, and sensors we were going to buy but there was a far greater selection than I had anticipated with all kinds of different specs, so I had to make a chart first to compare specs of each part |

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

| Functionality Demonstrated | Owner Feedback (Teaching team?) | Team Response |
| --- | --- | --- |
| Programming Approach in relation to project | Professor Peterson says it is a good approach. We do not need to worry about hardware specific programming and should research how to change clock speeds on microcontrollers | Approved |
| RC response | Professor agreed some autonomous throttle control could help. Needs simulations | It is a good start but needs to offer some autonomous assistance for the driver. Needs testing |
| Choosing hardware components | Need to compare power consumption between parts. | Leonid and Jeremy need to work together to find power consumption of each part and construct a power budget. |
| CAD Design | The CAD models needs to have more labels and annotations on it and be used for the force analysis | The envelope design needs to be improved in order to decrease wind resistance. |
| Simulation environment | The simulation needs to provide useful data, otherwise there is not a justified use for it | The simulation validates different system technical requirements but needs to fix importing of CAD model joints. |
| PCB Design | The diagrams need to be self documenting. The designs are hard to read. PCB routing needs to be done by hand, not the auto generated PCB routing. | Ryan will follow the Technical Documentation Standards in Engineering Design when making the System Block Diagram and reroute the PCB by hand. |
| Power Management | Not enough consideration was taken with respect to the power draw of unfinalized parts. | Power budget will be completed with all proposed parts in the BoM |

**Possible Sprint Improvements:**

There are multiple areas that need improvement during the next sprint in order to make sure the project is completed, and we meet all objectives. Several particular issues stand out that need significant work.

* Workload
  + There exists a large disparity between the work loads of different members and it needs to be addressed. Tasks need to be broken down better and distributed.
  + Where possible, 2 people should be assigned to help one another. If not, we should figure out a way to check in, in case a team member needs help.
* Task Approval
  + The SCRUM master should be more prepared to reject slides and work
  + All trello cards should have a slide completed for them after the task is finished, and the slide will be considered part of the task approval process.
  + Trello cards should be broken into multiple trello cards, or utilize the checklist function for cards with a lot of work. Each Trello card should be about one slide, and progress is presented and checked at each checkpoint. This can be broken down by the SCRUM master or person in charge of completing the card.
  + A new column in trello is created specifically for task approval
* Presentation Preparation with visual aids, and models
  + Future meetings with Alexey will be treated as small design reviews
    - A presentation will be prepared similar to the normal design progress review
    - A slide template will be made and submitted to Alexey for approval
    - We will take advantage of early submission of slides to the professors to identify any problems
    - A deadline will be enforced for slides for presentations, due 24 hours before the presentation. Exceptions for singular slides may be made for work being completed at that time
    - Most recent SCRUM master is in charge of the presentation, and will be in charge of slide order, general look, and ensuring everyone is prepared.
    - Must use an equation editor, all equations should be neat and easy to read. Must be accompanied by diagram, model etc to provide context. Also some simulations should show basic behavior
* Simulations, models, pugh charts etc
  + More simulation needs to be done to show solutions are optimal and worthwhile
  + Need to be annotated to be self documenting. These will also be submitted for task approval by the team.
  + All parts need to have justification and be defended
  + More tests need to be performed on code as it is completed
  + Power budget must be better documented by ALL members
  + Everyone reviews technical documentation file, currently pinned in Discord.
* Dependencies need more focus and emphasis
  + This needs to be clearly defined to ensure all tasks have necessary requirements fulfilled. May use teams of 2 to help with collaboration on some tasks.
  + Create new channels in discord for each subsystem role, where these dependencies can be discussed by all members, and have that information available for the rest of the team.
* Agendas
  + An agenda should be created for every Sprint meeting, specifically noting the deadlines for task requirements. Work should be noted better in minutes.

**Next Sprint Goals and Objectives:**

* Update block diagrams to be self documenting
* PCB routing done by hand
* 3D force diagram
* Buoyancy implemented in simulation.
* Propellers can turn and apply a force on drone in simulation
* Stress testing in Solidworks, new envelope design CAD’d
* Full and detailed power budget (should have ranges for motor and servo power draw and battery size)
* Begin working with Arduino, Raspberry Pi, and sensors and learn how to interact with them and interface them to each other
* Determine cameras and other remaining sensors used and how they will interface with the system
* Determine servo model after Force Analysis

**Meeting Minutes for Sprint 2 Week:**

**1/26/21 7:30 - 8:30pm**

* Sprint 2 Scrummaster: Jeremy
  + Sprint will be from beginning meeting of Thursday 1/28/21
  + Goes until Tuesday 2/2/21
* CAD model in a working simulation with controls: Milestone
  + Simulation working - Isaac (est 6 hrs)
  + CAD model works in it - Dylan (est 15)
  + Controls working from simulation - George (est 10 hrs)
  + Leon Ordering Sensors/ Microcontroller (est 3 hrs)
  + Jeremy/Ryan working on PCB (est 8 hrs)
* Added descriptions for some Trello cards, resubmitted sprint 0

**1/26/21 7:30 - 9:00pm**

* Re-worked system technical requirements
  + Will ask TA tomorrow how to re-do it
* Updated bill of materials with CAD files and CAD library checkboxes for each part
* Ready to order parts

**1/26/21 4:30 - 5:30pm**

* Meeting with TA Alexey
  + System technical requirements
    - Need to organize into systems and grouping of subsystems
  + Next week design review
    - Make slide for each task/deliverable

**1/27/21 7:30 - 7:40pm**

* Start Slides for Friday Meeting

**2/2/21 7:30 - 8:00p**

* Update Gantt Chart by Friday
* Everyone get their notebooks in shape
* Sprint Goals not met yet, sprint continues

**2/3/21 7:30 - 8:00p**

* Leon: Working on design review slides, waiting for parts ordered to arrive
* Jeremy: Working on slides, notebook, power sim complete as much as parts ordered
* Isaac: Got model working in Vrep, not able to apply forces yet -> focus for next week
  + Focus on making model spin
* Dylan: worked on CAD model
  + Side pieces cut down to 3d printable size, redid gondola to fit onto balloon
  + Did not know where to start with adding the microcontroller to CAD
  + Big question: How to fit in an envelope to the balloon
    - Possibly make our own envelope
* George
* Ryan: Busy with ECE121, unable to PCB in eagleCAD, will start tonight
* Bad estimate on simulator hours
* Worried about progress of the project, haven’t made much progress this sprint due to everyone’s workload
  + Much of the work has been based on Leon ordering parts and Isaac using Vrep
* Team works to work more overall
* Plan for Friday, modify 163 code to simulate our drone in RC control

**2/4/21 7:30 - 10:30p**

* Dylan: working on CAD, added holes and replaced the drone shaft
* Jeremy: slides finished
* George: updated system technical requirements, finished slides, created weight allocation sheet
* Isaac: working on finishing simulation
* Ryan: working on PCB, will include raspberry pi and camera modules later
  + Sensors and Arduino working in PCB
* Leon: Waiting for rest of the parts to be delivered
* System requirements: review block diagram
  + Went through each system and sub-system
* Practice slides
  + Went over a practice run
* Update gantt chart
  + Marked completed tasks, made notes on what tasks were pushed back

**2/5/21 4:30 - 6:30p**

* Follow up with Mircea with lab space
  + Other space may be given if we cannot get lab space on Delaware
* Get paperwork done to fly drone from BELS
* Submit proper block diagram by the end of next week

**2/6/21 7:30 - 8:30p**

* Sprint Report due tomorrow
* New Trello Board assignments
  + If task is done, make a slide for it
  + Do not split slides per person
* Practice design review slides with Alexei during Friday meetings
  + Make equations neater on slides
  + Turn in slides early to get them reviewed
* Peer reviews done by Tuesday
* Dylan & George: Working on force analysis
* Ryan: Working on PCB
* Jeremy & Leon: Working on power budget
* Isaac: Working on simulation

**2/7/21 7:30 - 9:30p**

* Working on the sprint report