Individual Lab Report #7

Progress Review 8

September 25th, 2025

Jet Situ

Team B

Teammates: Gweneth Ge, Lance Liu, Yi Wu, Joshua Pen

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1 Individual Progress

1.1 MRSD - Georgia Preparation

In the leadup to Georgia, the vast majority of my work was concentrated on the preparation of the drone for the Georgia event. Specifically, I focused on piloting the improved drone during the night regression tests that were conducted at Mill 19, followed by additional software work on setting up the UI needed to control the drone's actions. I restored the gimbal operation and integrated the software pipeline needed to support the build at Georgia, participating in upgrades and tests to ensure that the drone would be packed and ready. In addition, I worked on coordinating with the Lockheed team on the data packet flow during the event, as well as coordinating with the rest of the DARPA team to coordinate the logistics of being in Georgia.

1.2 MRSD - Georgia Event

During the Georgia event, up until the time of PR8, I worked on getting the drone operational and performant at the event. I first assisted with locating the box and supplies needed to be packed into the case for the event, followed by driving the team down to Perry, Georgia from Atlanta. I then worked on getting supplies for the team, before delving into the software work, where I repaired the radio transmission, actuated the gimbal system, and supported the flight operations during the first set of regression flights in Georgia. I then supported the reconstruction of the waypoint click governor in the Foxglove UI, as well as the secondary backup MAVLink protocol that allowed us to use a surrogate QGC for when challenges arose.

2 Challenges

2.1 MRSD - Georgia Preparation

One of the major challenges in the preparation for Georgia was inherent instability discovered in the drone's flight performance. This moderate instability, manifesting as distinct wobbling during ascent and turns, made it very difficult to balance the risk of the drone and the potential of overcorrections during autonomous flight. To resolve this, the rest of the team worked on switching out the motors and improving the overall PID tuning of the drone, which has helped significantly to mitigate these issues. The second major challenge was consistent interruptions to our work schedule. Feature development was stalled due to constant calls for testing and staging, which, as we only had a singular drone and battery to work with, consumed a significant amount of time on the project that we otherwise could've spent for robustness. This is a persistent challenge that we will have to live with for the time being, but will disappear once the obligations close to the event are over.

2.2 MRSD - Georgia Event

The largest major challenge that we faced was the loss of our RFD radio's functionality upon arrival in Georgia, and the subsequent near failure of other components. Specifically, we discovered that due to high bandwidth interference due to the sheer amount of

operating signals, our drone's standard RFD radio, used for high-fidelity connections over MAVLink as a fallback to QGC, was non-operational. To resolve this, I wrote a script that forwarded our connections over the DTC radio, restoring QGC connections. The second major challenge we faced was the continuous interruption cycles that consumed our drone's battery, thus throwing our schedule off track. Between needing to take the drone down for mechanical overhauls, to charging the battery, to needing the battery active to develop and test software, to flying, we were extremely resource constrained and constantly interrupted by field testing, which then stalled feature development and made progress difficult. Thankfully, we were able to eventually adjust and work through a different schema and changed our architecture to accomodate these changes.

3 Team Work

3.1 MRSD Project

Name	Contribution
Jet Situ	Worked on developing the newest set of pipelining and control software for the drone specifically on the Georgia development branch, including critical components to control the drone without direct line of sight. Coordinated logistical efforts before and during Georgia for MRSD team, acting as primary point of contact between the team and Lockheed Martin. Aided in the development of gimbal algorithms and changes to software for the newer radio and control links.
Joshua Pen	Conducted mechanical repair of the drone while in Georgia and prior to shipment to Georgia via packing of the drone, designing, printing, and assembling the battery cage and motor mounts. Worked on repairing the landing legs and the replacement of the top board. Aided software team in debugging and in field tests.
Lance Liu	Conducted the primary software work on the pipeline to the DTC team in terms of coordinated fields. Specifically, worked on migrating the gimbal data and combining it with other segments to develop out the "burst recorder" feature with the geolocation feature to validate on the physical drone. Put effort into the behavior tree, which is designed to support the drone in performing autonomous flight as a direct rewrite of our existing system.
Gweneth Ge	Conducted overall mechanical overhaul work on the drone, including the reassembly of the motor mounts, and reassembly of the new ESCs and motors to support additional stable flight. Worked to resolder broken wires and reconnect systems that broke during transit to Georgia. Assisted with drone leveling and propeller assembly, as well as production of additional solder joints for new JST connectors. Worked on disassembly and reassembly of the drone for repair work, assisted with misc. mechanical tasks.
Yi Wu	Conducted the initial work for the burst recorder node. Otherwise, served as liaison in Pittsburgh while rest of team went to Georgia.

Table 1: Team Members and Their Contributions

4 Plans

4.1 MRSD Project

Name	Contribution
Jet Situ	Will work on the primary operations for Georgia, including being the single operator of the drone during the competition. Will then work on packing the drone and preparing it to ship back to Pittsburgh at the conclusion of the competition, and then work on debriefing the collected data. Will also work on final integration with Lockheed to synchronize any remaining radio meshes to avoid cross-interference, as well as practicing with the rest of the team to improve coordinating during the time-limited event.
Joshua Pen	Will continue to work during mechanical operations throughout the Georgia event to mitigate and repair damage in between scored runs. Will act as a secondary mechanical support and software support until the drone is returned to Pittsburgh, participating in field tests.
Lance Liu	Will continue to work with the DTC team to integrate the final scoring submission pipeline, which is to be routed through a series of network switches to simulate proper communication demarcation. Will also assist with final software debugging for the behavior tree and geolocation optimization in the leadup to the competition, before assisting with field tests and other misc. tasks in Georgia.
Gweneth Ge	Will continue to work and support the DTC team with final mechanical changes, and provide support from Pittsburgh. Will work on the retrofit of the drone after its return to Pittsburgh for the FVD tasks and the reallocation of drone resources, as well as the removal and return of expensive components.
Yi Wu	Will work on developing a plan for the FVD retrofit of the drone, including required components and needed assembly timing. Will recieve the drone post-Georgia and assist in retrofitting efforts to support FVD operations.

Table 2: Team Members and Their Plans