# Individual Lab Report #4

Progress Review 3

March 21, 2025

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Team B

Teammates: Gweneth Ge, Lance Liu, Yi Wu, Jet Situ

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# 1 Individual Progress

## 1.1 PCB Assignment

In our recent project, Jet led the PCB assignment, ensuring its successful completion. Meanwhile, I helped design the Progress Design Review and Progress Review 3 slides. I also helped Gweneth with constructing the SVD and FVD one-page descriptions.

## 1.2 MRSD Project

For my contributions during the period leading up to Progress Review 3, I collaborated with Lance to integrate the path planner for Geofence zone searches, the local search of the patient planner, and the patient triage planner within the behavior tree, ensuring smooth operation with the patient detection algorithm. Following the replacement of the Doodle Labs radio with a Rajant DX2 radio, I designed a new top mount accommodating the Rajant DX2, the NVIDIA Orin, and the GPS module (Figure 1). Additionally, I contributed to wire management efforts, enhancing the overall organization of the system and helped with Triage Data Collection from out test flights.

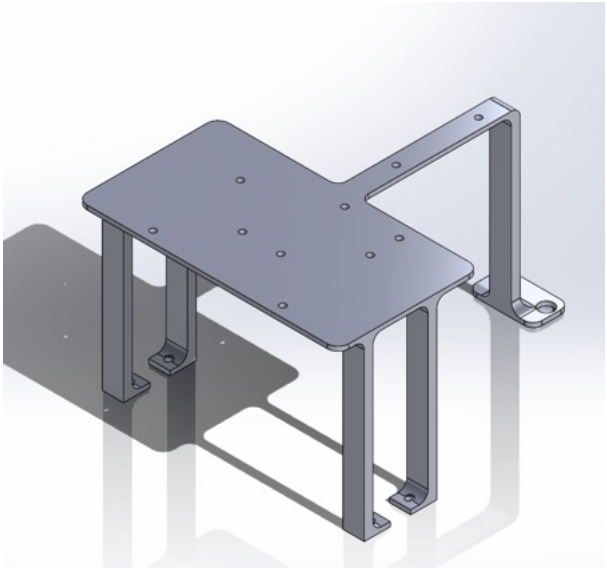

Figure 1: Top Attachment Mount for Rajant DX2, NVIDIA Orin, and GPS Module

# 2 Challenges

## 2.1 PCB Assignment

In our recent project, I did not encounter any challenges with the PCB assignment, as Jet effectively managed this aspect. Also, there were no major challenges that I faced when constructing the Progress Design Review and Progress Review 3 slides and the SVD and FVD one-page descriptions.

## 2.2 MRSD Project

The MRSD project presented significant challenges in managing time among preparing for the Preliminary Design Review (PDR) and Progress Review 3 (PR3) presentations, organizing the Industry Demo Day, advancing the MRSD project itself, and keeping up with academic coursework. Balancing these concurrent responsibilities required meticulous planning and effective time management to ensure all tasks were completed.

# 3 Team Work

## 3.1 MRSD Project

| Name | Contribution |
|---|---|
| Jet Situ | Represented the MRSD team at the DARPA Triage Workshop 2 event in Georgia, working alongside Lockheed Martin engineers to integrate their drone prior to competition data collection. Then worked to coordinate drone flight permissions and capability prior to the Team Chiron Demo Day event. Acted as safety pilot and speaker during the Industry Demo Day, and performed flight testing on the days prior for drone endurance and capability integration. Designed and submitted the PCB final draft creation materials. |
| Joshua Pen | Assisted in fully integrating and test Path Planner for searching the Geofence Zone and Local Search of Patient Planner with behavior tree (also integrate with Patient Detection), Design, integrate and test Triage Planner. Triage Data Collection from Test Flight. Design new mount for Rajant DX2 radio. Contribute to wire management. Contributed to project management and logistics. Helped Setup Industry Demo day, and create slides for Demo Day presentation. Helped construct presentation for PDR and PR3. Helped construct SVD and FVD one-page description. |
| Lance Liu | 1. Autonomy: Resolved takeoff interruption issues through EKF sensor data analysis; Debugged compass instability; Assisted in drone battery monitoring module; Supported Foxglove UI development; Integrated improved geofence mapping algorithm; Initiated NDAA-compliant RTK integration; Refined overall autonomy system robustness.<br>2. Detection System Enhancements: Tested multiple detection models with flight recording; Optimized person detection model deployment (30x faster inference); Configured Docker for PyTorch on edge devices; Improved gimbal lock functionality for detected persons (in progress); Initiated intelligent autonomy pipeline (in progress); Enhanced thermal detection through data augmentation and model fine-tuning; Established real-time casualty GPS coordinate estimation and transmission pipeline.<br>3. Ground Control Implementation: Deployed ground control station with reliable drone communication; Ensured robust command execution; Resolved ROS2 FastDDS middleware issues between containers.<br>4. Additionals: one-line autonomy launching draft; preflight checklist draft; power distribution PCB board and tracing; Initiated ATAK integration; Provided technical support for demonstrations and workshops. |
| Gweneth Ge | Provided operational support including communication with airlab and media for the Industry Day demo, making slides for Jet presentation, and video review and editing of collecting data from various test flights and darpa workshop. In addition, I primarily contributed to the issue tracking and presentations required by MRSD project including SVD, FVD, project mangaments, and PR 1, 2, 3. |

| Name | Contribution |
|---|---|
| Yi Wu | Debugged the low latency issue of the people detection algorithm. Wrapped up the gimbal code for Darpa Workshop. Assist Lance with the thermal detection algorithm. Volunteered as the casualty in the Air-Lab Industry Demo Day. |

# 4 Plans

## 4.1 MRSD Project

| Name | Contribution |
|---|---|
| Jet Situ | Will work on robustness and cleaning procedures prior to SVD flight tests. Will coordinate and work on integrating gimbal software with Lockheed Martin and Lance. Will work with Wuyi and Lance on software reorganization and documentation prior to SVD. Will assist Josh on mechanical redesign of drone to increase performance. |
| Joshua Pen | Contributed to project management and logistics. Design new mount for all components on drone (to reorganize components and drone wiring). Help design the Inter-UAV De-conflict algorithm. |
| Lance Liu | 1. PX4 Autonomy Enhancement: Complete NDAA-compliant RTK integration; Further refine autonomy system robustness through comprehensive testing; 2. Detection System Completion: Finalize person detection model optimization; Complete gimbal lock functionality for detected persons; Implement and test intelligent autonomy pipeline in field conditions; Explore ID&Re-ID capabilities beyond person detection. 3. System Integration: Complete ATAK integration for drone control; Finalize GPS coordinates estimation accuracy for detected casualties; Optimize real-time data transmission pipeline; Integrate all subsystems more cohesively. 4. Testing: Conduct extensive field testing |
| Gweneth Ge | I will continue working on overall project management and communication with airlab, potential media/sponsors as well as NREC/Mill19. In addition, I will help with Josh on reorganizing components and drone wiring, along with the inter-uav deconflict algorithm. |
| Yi Wu | Integrate the human pose detection algorithm in the perception module; upgrade the pose detection with known gimbal specs like intrinsic matrix. Working with Lance, check if AirLab has implemented the Re-ID algorithm; if not, review SOTA Re-ID algorithm and wrap it into ROS2 pkg. |

Table 2: Team Members and Their Plans