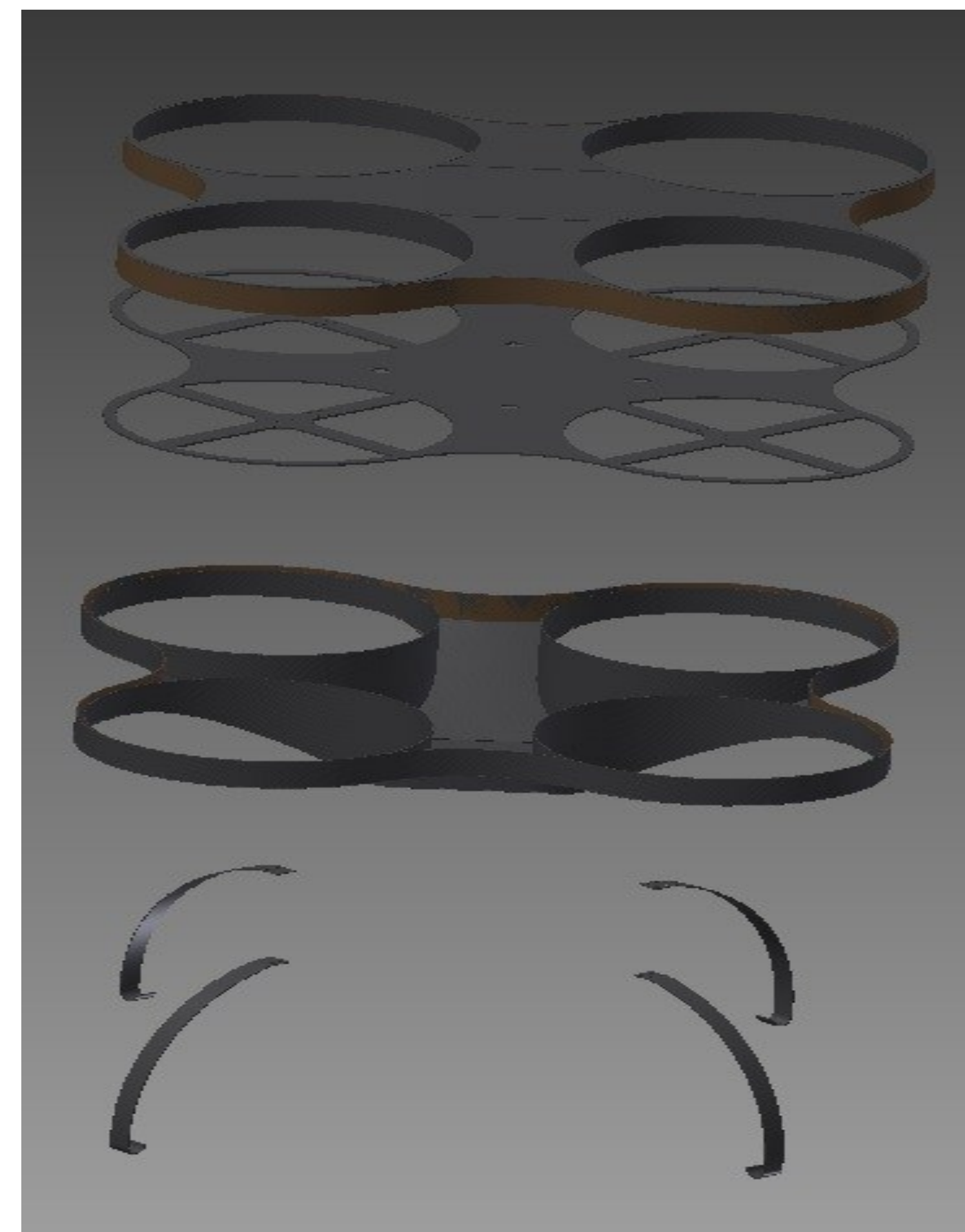


## Abstract

The goal for this project was to redesign and rebuild Mercer's current autonomous quadcopter system. More specifically, the goals were to achieve autonomous, stable flight and GPS waypoint navigation. The top-tier goal for the project was to achieve completely autonomous takeoff and landing. The design and parts were recommended based on a chief application of agriculture. However, it was also designed with the capability of replacing certain parts to easily and quickly change applications. The previous purpose of the quadcopter was participation in a national competition, which had many design constraints (for example, size and weight). Therefore, since the copter is now being used for more of a real-life application, there are no longer size constraints. The only potential size constraint will be that the copter should easily fit into a vehicle for easy transport. The real-world constraints for this project will be stability under operation, communication, and travel time.

## Design

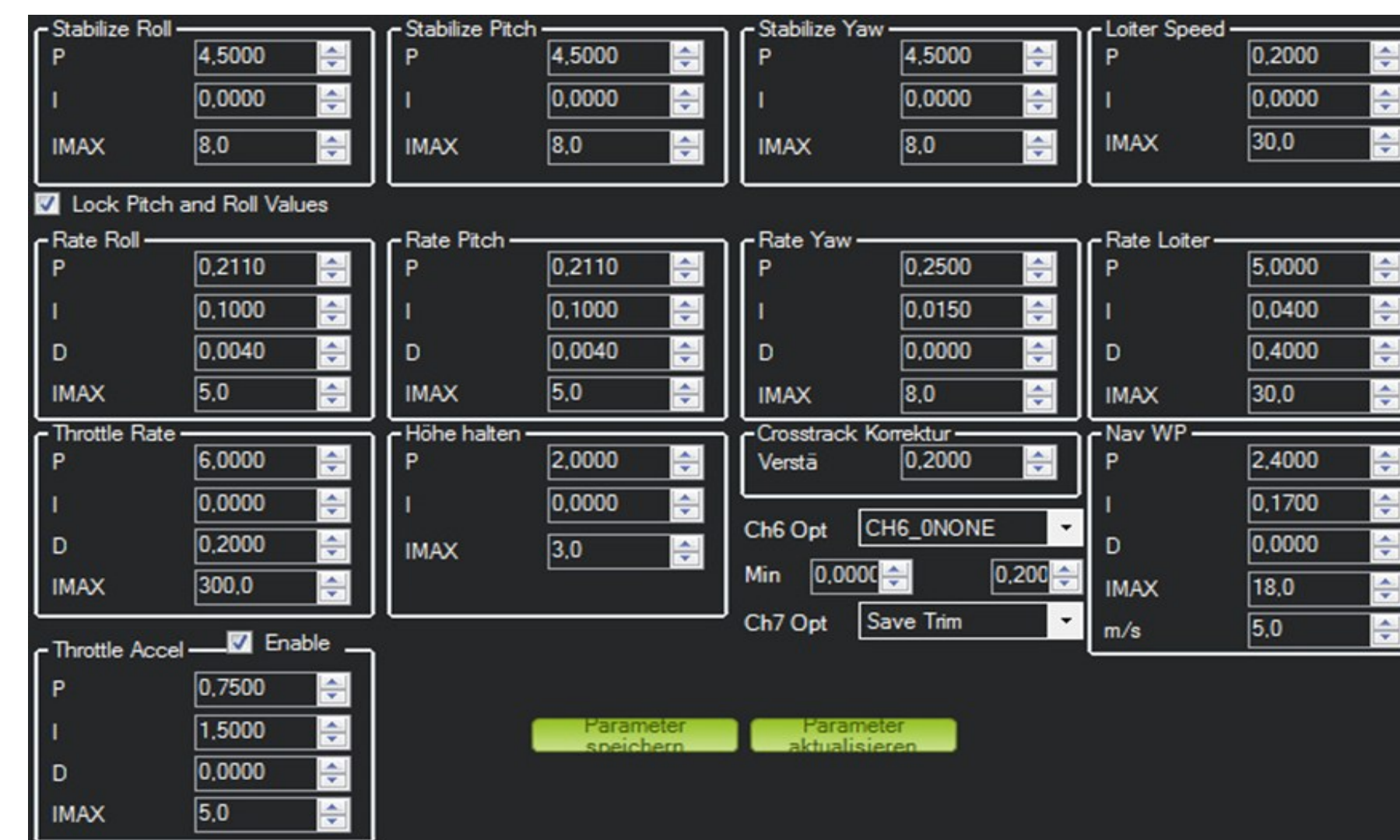
A main goal the team needed to accomplish with this copter design was to make the innards of the vehicle easily interchangeable. This was accomplished by creating a very modular design. The client suggested that the majority of the payload be carried at a considerable distance below the level of the motors and propellers. He also requested that the body be made such that the user could easily access the batteries, camera, and processor to exchange them depending on the application. Therefore the body should not be completely sealed and the inner workings of the copter should be held closely together and in an easily accessible spot.



## Testing

### Tests:

- . *Battery Quality*: Ability of batteries to experience multiple flights and charges
- . *Stability*: Ability to achieve stable flight
- . *Thrust*: Determine amount of thrust created by the platform
- . *Flight Time*: Determine maximum flight time with differing props
- . *Autonomy*: Ability to perform waypoint navigation



## AUVSI Conference

In February of 2014, the team accompanied the client to and made a presentation at the Association for Unmanned Vehicle Systems International (AUVSI) Unmanned Systems in Agriculture conference in Tifton, GA. This conference serves to discuss research and development that members, companies, and universities are making with unmanned systems in agriculture and farming.

According to the experts at this conference, agriculture is expected to make up 80% (or \$83 billion) of the commercial UAV market over the next ten years. It is likely that agricultural applications will be approved for UAV use by the FAA fairly soon because of the high demand for such inventions and low risk of accidents in rural areas. Because of the growing world population and farming industry, farmers have expressed a need for inventions that can accommodate this growth by lowering costs and increasing productivity.

## Conclusion/Future Work

This project has amazing potential. Unfortunately, it did not get developed to the desired point during this semester. However, this team made recommendations for the project's hardware and were still able to test those parts. The team stands by the recommended parts and knows that they will work swimmingly with the designed frame when it is completed. Most of the project's outcome was out of the team's control, but miscommunication is partly to blame. The project's scope greatly increased in exchange for the help of the external team members. Because the quadcopter project has now expanded into the construction of three copters instead of one, MGSC had to make changes to the way the molds and frame were constructed. The molds needed to be reused in order to construct two more duplicate frames. As a result, MGSC had to order several parts through MERC, and waiting for those parts took a considerable amount of time away from building the frame. Flight stability should greatly improve with the completion of the designed frame. The immediate goals (for the next project group) should be the same as the original goals for this team. Additionally, autonomous takeoff and landing should be achieved. The mobile capabilities should be heavily developed in future work. The Android mobile apps will make the project very portable by use of phones and/or tablets. This will be extremely helpful for the applications for which this copter is intended.

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- . Jovan Monroe and Will Daniel
- . Drs. James Wright, Kevin Barnett, and Anthony Choi

## Testing Platform



## Testing Apparatus



## References

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