Recovery Unmanned Aerial Vehicle (RUAV)

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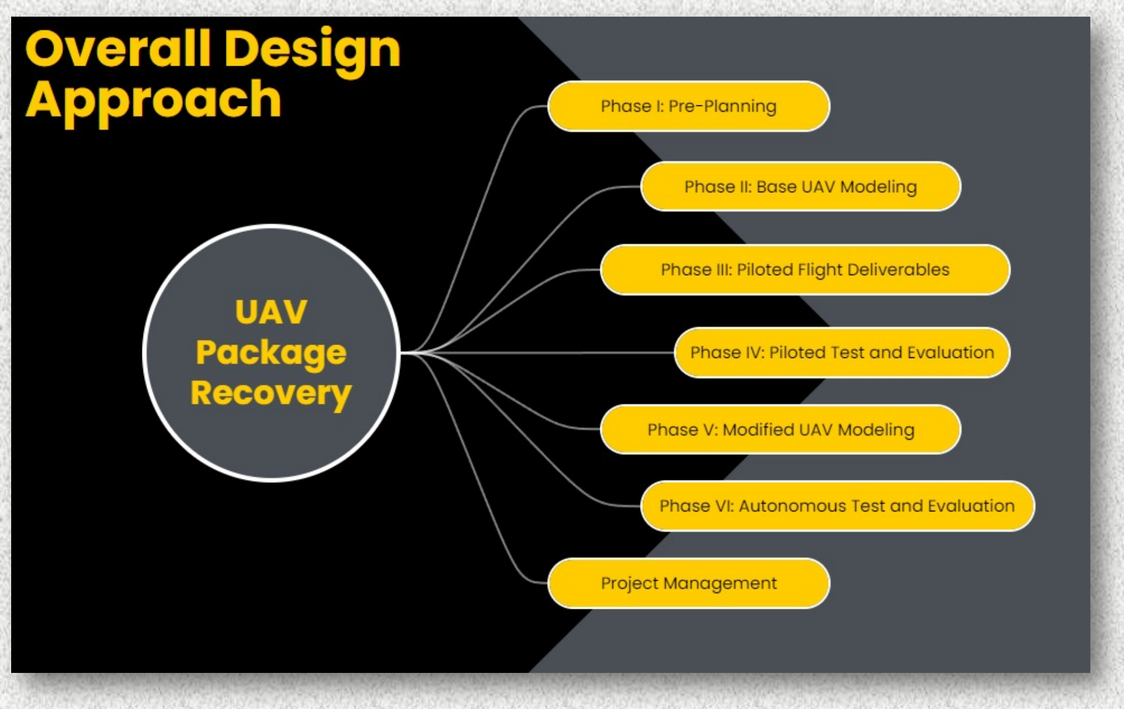
Project Background

MathWorks Excellence in Innovation projects provide students with a means to gain practical experience on real world technology and industry challenges. The goal of the MathWorks UAV project is to continue exploring the evolving development of drones, and build knowledge on drones, controls systems and hardware assembly.

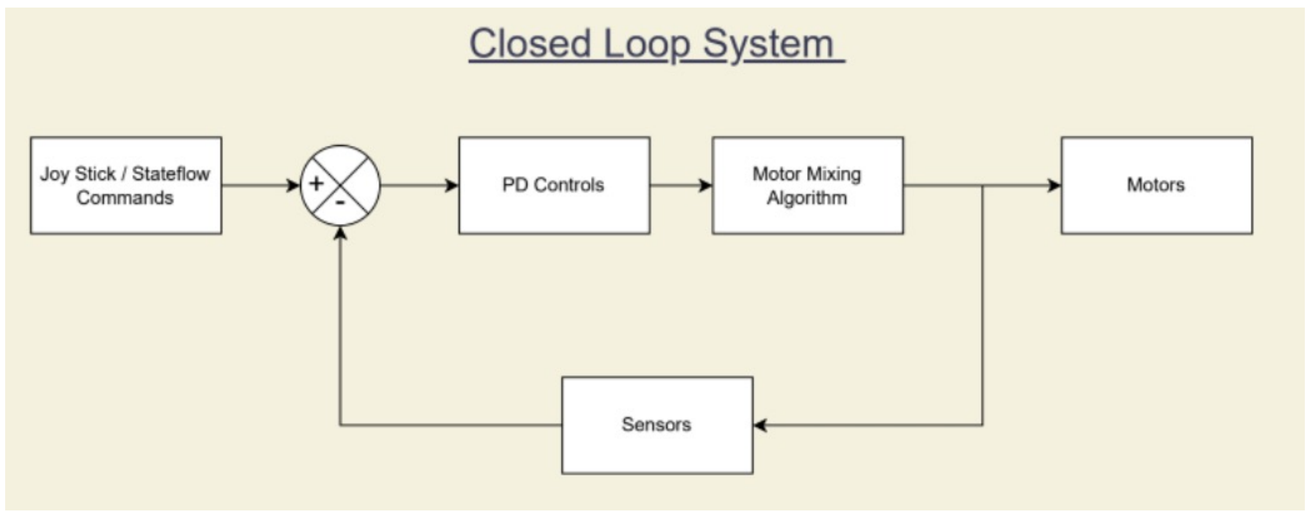
Project Objective

The objective of the Package Recovery test by an Unmanned Aerial Vehicle (UAV) is to determine if a hook transport system is a viable means to recover a payload.



Design Approach

No.	Requirements	Capabilities
1	Desired Payload	50 g < x < 150 g
2	Max Weight of UAV w/ battery	545.2 g
3	Desired Speed	5 mph < x < 15 mph
4	Desired Flight Ceiling	2 ft < x < 5 ft
5	Desired Range	3 m < x < 5 m
6	Physical Safety	Bumpers, Cage
7	Safety Flags	Landing
8	Quadcopter Configuration	X-Configuration
9	Reference Frame	NED Configuration
10	PD Controls	4 Total
11	PX4 Mini Flight Controller	Brain of Drone

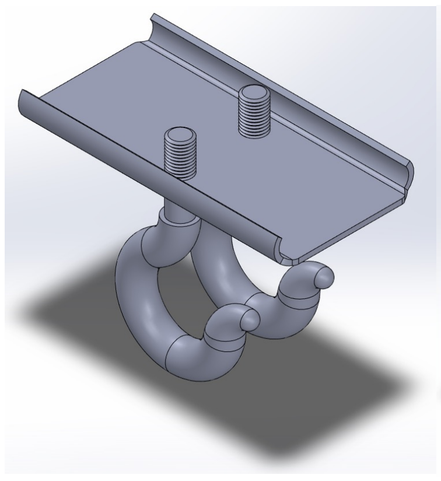


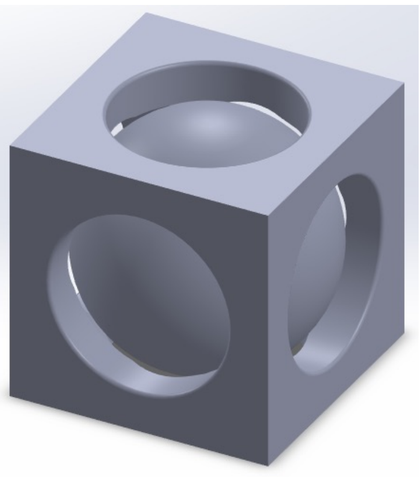
The process that radio transmitters or autonomous commands take to obtain the desired UAV orientation.

Package Recovery

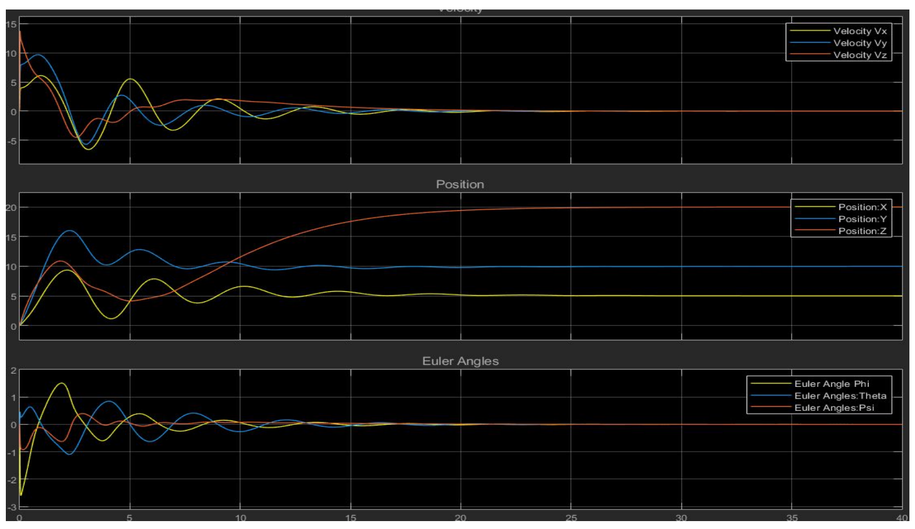
The package recovery system of the UAV consists of two main components. One is a clip-on hook system. Two, a ball in cube package design.

Not shown: 2 fisheye hooks on the package for the drone to link to.





Results



Left: Thrust, roll, pitch, and yaw PD controls show stabilization after the initial take-off sequence.

Right: The drone autonomously flies around in simulation space using the team-designed flight control system.

Conclusion

The team successfully designed a flight control system using MATLAB and Simulink for a QAV250 drone frame that enabled communication between the hardware and the flight controller. A state flow model granted the UAV a simple autonomous flight path to follow for testing purposes. Utilizing SolidWorks, the team crafted custom package transportation designs, and 3D printed them to allow drone modification. Despite project delays due to radio setup complications, the project met all ten system requirements. However, the team is currently still testing the flight controller with the hardware and plans to have it flying in a controlled environment.