Virginia Tech SUAS 2023 Video Summary - README

Introduction

This README provides a concise overview of the Virginia Tech team's preparation for the SUAS 2023 (Student Unmanned Aerial Systems) competition, as depicted in their video presentation. Jaeger is an autonomous quadcopter. We will provide an overview of Jaeger's key features, design considerations, safety measures, and flight tests with excluding mechanical and manufacturing details.

Jaeger is a custom quadcopter aircraft designed for autonomous flight and precise air delivery of multiple water bottles. The primary focus during its development has been on ensuring safety, reliability, and efficiency to meet the challenging payload delivery criteria of the competition.

Key Features and Design Considerations

Airframe and Weight Reduction

Jaeger's airframe underwent extensive simulations and analyses to ensure structural integrity while reducing weight. The final weight of the aircraft is 850 grams, optimized for agility and payload capacity.

Propulsion System

The propulsion system of Jaeger is designed for optimal efficiency, featuring low KV Motors and large propellers. This design choice enhances flight stability and efficiency.

Power Source

Jaeger is powered by a 6s 25 amp hour Li HV battery pack, providing an extended flight time and a theoretical range of 13.5 miles.

Autopilot System

The Cube Orange autopilot system was chosen for its ability to fulfill requirements and its open-source nature. It is equipped with an external GPS module for precise location data.

Ground Control Station

The ground control station comprises a laptop with Q Ground Control software and a Hearlink transmitter system for communication with Jaeger.

Payload Delivery System

Jaeger's delivery mechanism includes a custom-designed winch and release system for dropping water bottles from 80 feet above the ground. The system has been modified for accuracy and risk reduction.

Safety Measures

Ensuring safety has been a top priority in Jaeger's development and testing:

- All team members received strict safety training and adhered to safety guidelines.
- A designated safety lead oversaw safety protocols.
- Safety equipment was readily available.
- Individual component testing and a safety checklist were conducted before each flight.

Flight Tests

To evaluate the reliability and performance of Jaeger, various flight tests were conducted:

- Simulated aircraft were introduced to simulate collision risks, which were successfully avoided during tests.
- Two full mission tests were carried out, achieving high mission scores without penalties.
- Flight performance demonstrations included manual and autonomous takeoffs, landings, and meeting specific flight performance requirements.

Conclusion

Jaeger is a mature and safe autonomous aerial vehicle, ready to participate in the 2023 SUAS competition. The team's dedication to safety, extensive testing, and design considerations have resulted in a reliable and high-performing aircraft.

Literature Cited

SUAS Competition. (2023, June 21). Virginia Tech - Autonomous Aerial Vehicles (AAV) | SUAS 2023 [Video]. YouTube. https://www.youtube.com/watch?v=AHY6LiMtzWY