# Saint Louis University SUAS 2023 Video Summary - README

## Introduction

This README provides a concise summary of Saint Louis University's preparation for the SUAS 2023 (Student Unmanned Aerial Systems) competition, as depicted in their video presentation.

## Team Credentials

- \*\*Certified Pilot and Ground Operator:\*\* The team had a certified pilot and a dedicated ground station operator for managing missions via telemetry.

- \*\*Camera Setup:\*\* They utilized a GoPro camera capable of recording in 1080p at 60 FPS, paired with a GPU Jetson Nano for processing.

- \*\*Telemetry System:\*\* Their telemetry system operated at 915 MHz, with an impressive range of up to 3000 feet.

- \*\*Transmitter and Receiver:\*\* The team used a Futaba 10J transmitter and a Futaba R3008 SB receiver, both operating at 2.4 GHz.

## Propulsion and Motor Testing

- \*\*Electric-Based Propulsion:\*\* They utilized an electric-based propulsion system powered by a 10,000 milliamp-hour LiPo battery.

- \*\*Motor and Propeller:\*\* They employed an A60 motor with a 5x40 propeller, boasting an 18-inch propeller diameter. Motor performance was rigorously tested on a thrust stand, reaching a remarkable thrust of 30 pounds at 1780 PWM signal.

- \*\*Load Cell:\*\* For precise thrust measurements, they used a type S load cell.

## Control and Navigation

- \*\*Control Hardware:\*\* A Pixel 4 Mini served as their controller hardware, paired with a PX4 autopilot as the flight controller.

- \*\*Flight Controller Firmware:\*\* The flight controller ran on PX4 autopilot firmware, an open-source solution capable of waypoint navigation.

- \*\*Flight Planning:\*\* Flight plans were created on a Windows 10 laptop and uploaded to the Pixel 4 Mini.

- \*\*Obstacle Avoidance:\*\* Their UAS boasted an advanced obstacle avoidance algorithm, creating circular boundaries when detecting other Autonomous Unmanned Systems (AUS) and generating additional waypoints to navigate around these boundaries.

## Onboard Data Link Camera (ODLC)

- \*\*ODLC Camera:\*\* A Sony RX100 V2 camera was employed for Onboard Data Link Camera (ODLC) purposes.

- \*\*Performance:\*\* The ODLC system performed admirably, even when processing data from the camera at 360p resolution. The Jetson Nano's GPU proved capable of handling the task.

## Testing and Results

- \*\*Flight Duration:\*\* During testing, the UAS achieved an impressive flight duration of 19 minutes and 46 seconds, covering distances of up to 1600 feet while maintaining a connection every second.

- \*\*Telemetry Performance:\*\* Out of 1187 telemetry messages sent, only 37 were lost, highlighting robust communication capabilities.

- \*\*Navigation Success:\*\* The UAS successfully followed 64 out of 94 waypoints across four different flight plans, demonstrating its reliable navigation capabilities.

- \*\*UAS Detection Algorithm:\*\* Regrettably, the team was unable to test their UAS detection algorithm during this project.

## Funding

- The team expressed gratitude for receiving a grant from NASA through the Missouri Space Grant Consortium, which significantly contributed to the success of their UAS project.

## Literature Cited

SUAS Competition. (2023a, June 21). Saint Louis University - AirCRAFT Lab SUAS | SUAS 2023 [Video]. YouTube. <https://www.youtube.com/watch?v=9MQUOILc-XM>