AIRCRAFT TRACKING WITH ADS-B

Freeman Allred, Morgan Grant, Zach Lauritzen, Greg Liebelt, Alex Rooney, Anthony Russo
Advised by Dr. Stephen A. Mascaro

Department of Mechanical Engineering
THE UNIVERSITY OF UTAH

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INTRODUCTION

A device that autonomously tracks aircraft and maintains a direct line-of-sight is needed as a platform for establishing secure lines of communication. All commercial aircraft are required to have **Automatic Dependent Surveillance – Broadcast (ADS-B)** transmitters‡. This technology utilizes an onboard system that periodically transmits aircraft position, altitude, velocity, and identification information. The transmitted data can be received by our device to track a specific aircraft and provide visual target confirmation.

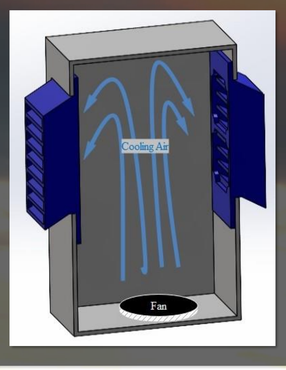
‡: https://www.ecfr.gov/cgi-bin/text-idx?node=14:2.0.1.3.10#se14.2.91_1225

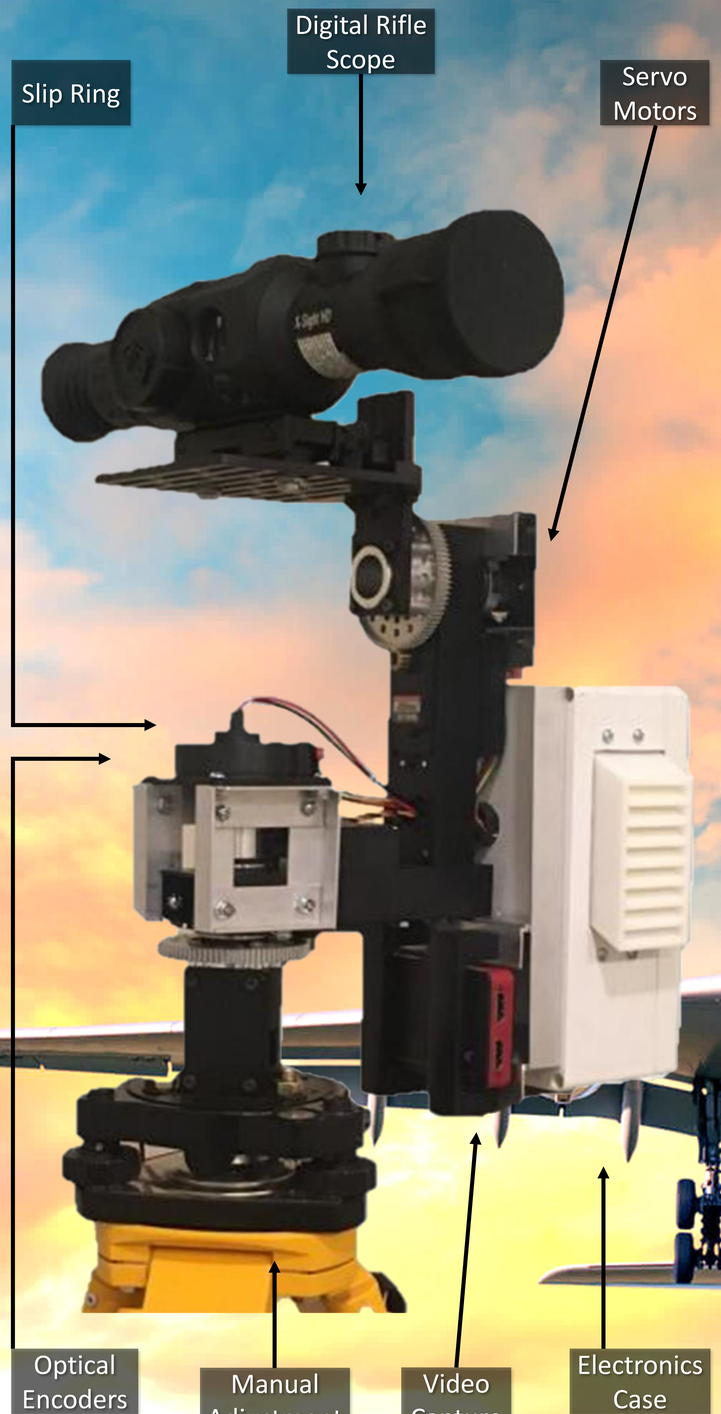
SYSTEM REQUIREMENTS

- Visually track in-flight aircraft using ADS-B signals
- Achieve a high degree of accuracy for imaging aircraft
- Record nearby flight data
- Be easily portable (Weigh less than 40 lbs)
- Have remote operation capabilities
- Withstand extreme environmental conditions
- Wirelessly relay live video data to the user

ELECTRONICS CASE

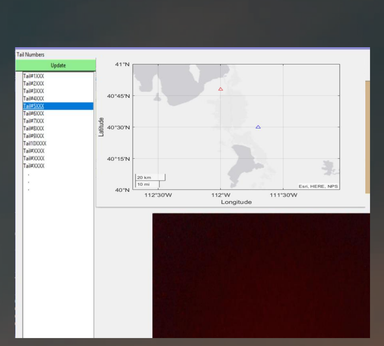
In order to facilitate outdoor operation and keep the primary system control components safe, a polymer project box is implemented to ensure airflow for thermal regulation. A LattePanda development board computer running Windows 10 serves as the system's central processing unit.





TRACKING AND DEVICE OPERATION

The system is controlled using a remote-in connection and a Python-based graphical user interface (GUI). The GUI populates a list of tail numbers for nearby aircraft using data from the ADS-B receiver. The user selects a tail number and the system begins tracking that aircraft. A live video feed of the aircraft is displayed, and the aircraft's location is plotted on a map within the GUI. Due to the high level of accuracy desired by the client, a proportional-integral-derivative (PID) controller refines movement and control when commanding the device. The PID controller minimizes any overshoot while maintaining the optimum rotational speeds of the servo motors.



CONCLUSION

The system can read ADS-B data from nearby aircraft and send that data to the LattePanda computer. From there, an aircraft's position and velocity are determined from Global Positioning System (GPS) and other pieces of ADS-B data. The LattePanda compares this information with the system's own GPS position, then it calculates motor commands to point at the aircraft. This process is then autonomously controlled with the PID controller, allowing for live tracking of the aircraft. Results from system performance will be used by L3Harris to determine ADS-B reliability.