# Drones For Humanity

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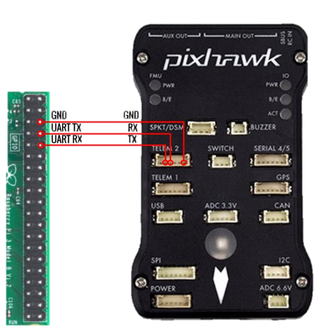
## Overview

Catastrophic wildfires have caused much damage over the years and they can be untraceable until it is too late. The “Pink Panther” fixed-wing UAV aims to help detect these fires before they can no longer be controlled. The aircraft is designed for low-speed aerial surveying to detect wildfires and alert flight personnel to a fire’s location. The airframe can also be used for similar surveying applications while only changing the neural networks image detection.

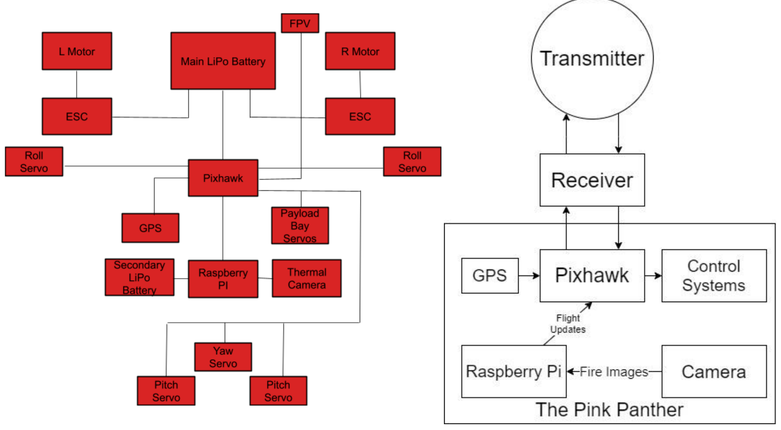
## Avionics





The Pixhawk flight controller communicates with the manual control transmitter and the autonomous flight software QGroundControl (QGC) to create a manual-autonomous flight mode toggle. The Pixhawk autonomously controls all control surfaces based on a preprogrammed flight planned. The wildfire detection system will work through the Raspberry Pi to make updates to flight information with the Pixhawk.

## Power and Controls Diagram




## Structures

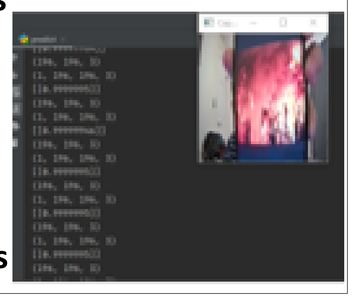
- Wings and horizontal stabilizers are made from a high-density foam
- The nose, tail, and vertical stabilizer are made from a lower density foam
- A water-based sealer was used to increase the rigidity of all foam sections
- Aluminum 6061 spars are placed in two spots in the wings and both stabilizers
- The fuselage is made of 6.625in diameter, schedule 40 PVC for structural integrity and ease of fabrication

## Vehicle Design

- 2m wingspan
- NACA 4418 airfoil
- 0.25m wing chord
- 1.55m fuselage
- Weight: 11.8kg
- Traditional landing gear
- Glide ratio of 18

## Wildfire Detection System

- A camera sends visual information to a neural network to detect wildfires
- The neural network is a convolutional neural network with 6 hidden layers
- The neural network is 98% accurate at identifying fires

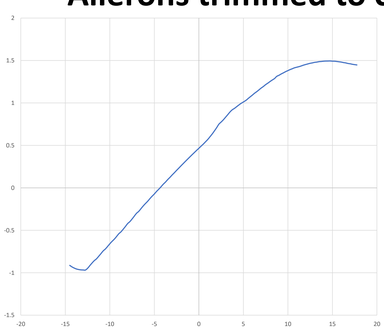


## Propulsion

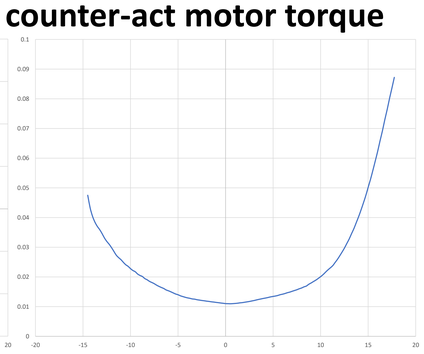
Twin 710kv motors rotate 12x8 propellers at approximately 6500RPM. This radial speed generates 22N of thrust giving the aircraft an expected velocity of 25m/s. With a 16000mAh battery, the aircraft is capable of a 30-minute loiter time.


## Aerodynamics

- Incidence angle of $2^o$
- Cruising lift of 112N
- Total drag of 8N
- Max climb angle of $8^o$
- Center of gravity is 0.2m aft the wing
- Ailerons trimmed to counter-act motor torque



Coefficient of Lift vs. AOA



Coefficient of Drag vs. AOA

## Payload

The payload system accounts for both droppable and stationary payload systems. The airframe allows for a mission-specific, droppable payload of at maximum 2.3 kg. The payload bay can be controlled manually or autonomously. The stationary payload includes the camera and Raspberry Pi used for wildfire detection.

**Acknowledgements:** We would like to thank Chris Larsen (Flight Supervisor) and Connor Hill (Graduate Student) for their guidance throughout the course of this project.