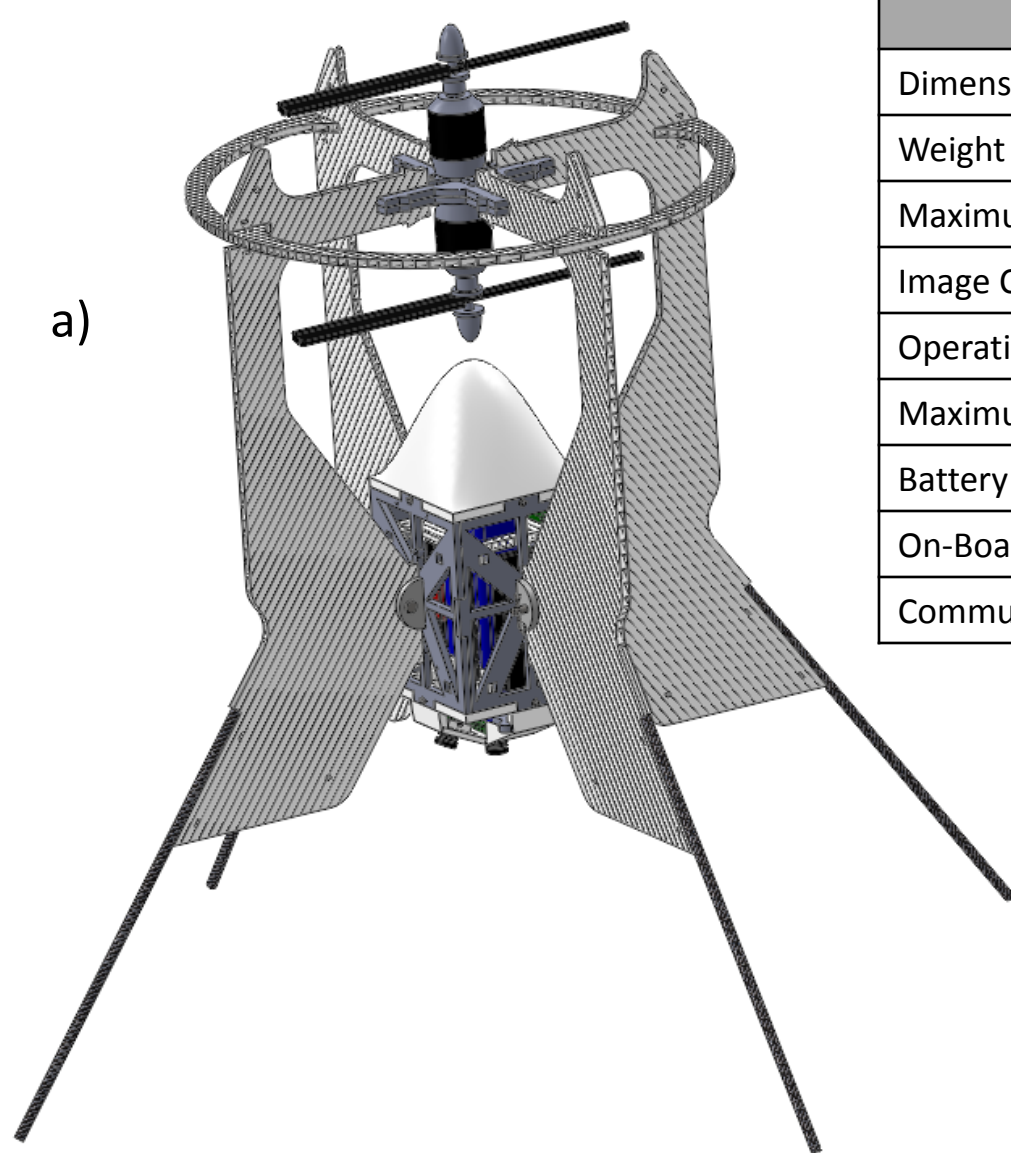


## ABSTRACT

This project involved the design and realization of IPASS, an inexpensive, one-man operable and short range UAV. IPASS is designed as a compact and optionally disposable UAV that only requires one person to transport, assemble, and launch. Currently UAVs are expensive and require multiple users to operate. IPASS fills this gap by serving as an inexpensive optionally recoverable UAV capable of being developed quickly to supply surveillance information when required.

## SYSTEM DESIGN



SPECIFICATION	
Dimensions (LxWxH)	28.94 x 28.94 x 26.01 in
Weight	4.4 lb
Maximum Flight Height Achieved	15 ft
Image Capture Rate	1 image per second
Operating Time	2.5 min minimum, 4 min typical
Maximum Thrust Power	1300 W
Battery	13.2 V 4.2 Ah, Lithium Iron Phosphate
On-Board Computer	Gumstix Overo FE COM & Arduino Pro Micro
Communications	USB 2.0, Wireless-G, 2.4 GHz DSSS

Table 1 – Design specifications for IPASS

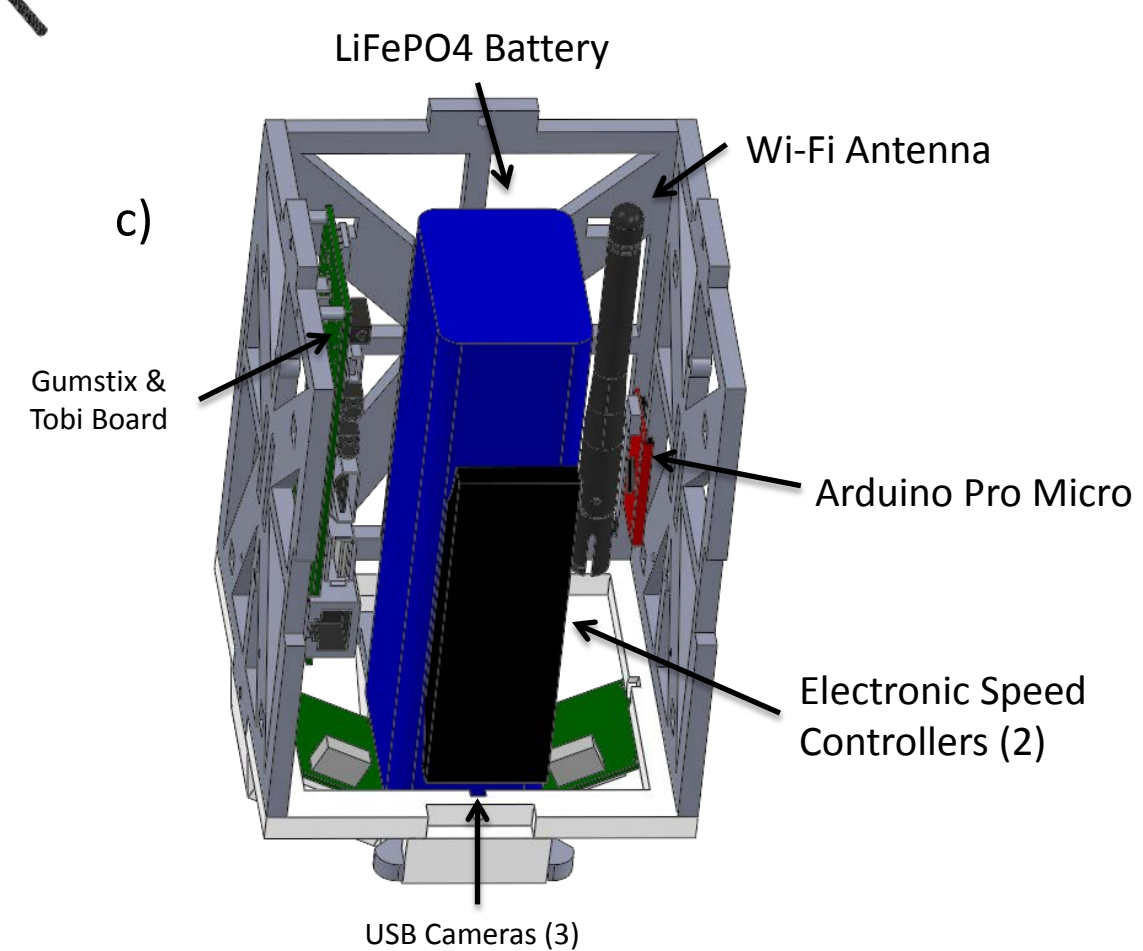
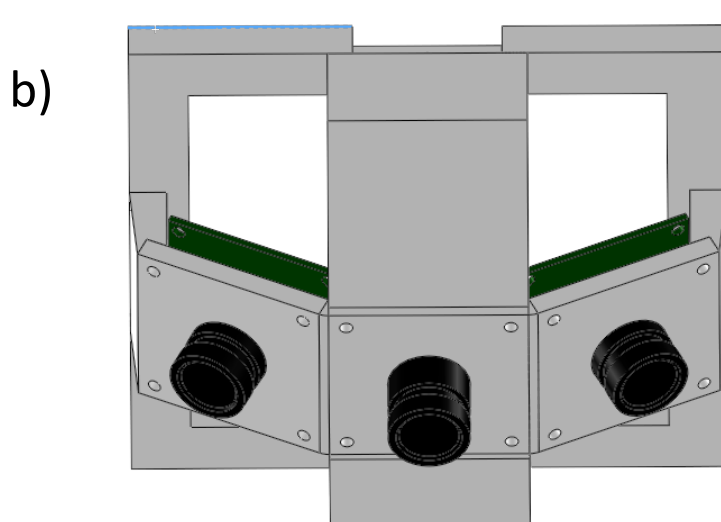


Figure 1 – a) CAD model of the entire UAV, b) CAD model of the camera layout, c) CAD model of the electronics layout

## IMAGE STITCHING

- Three individual images
- Predefined calibration values allow for efficient image processing
- Precomputed homography matrices allow for efficient image stitching
- Results in processing delay that is shorter than the capture time



Figure 2 – a) Three individual images before calibration and stitching, b) Final calibrated and stitched image

## SOFTWARE

- Easy to use with a simple interface
- Automatically updates images
- Gives control over the IPASS propulsion system
- Displays position information of the IPASS

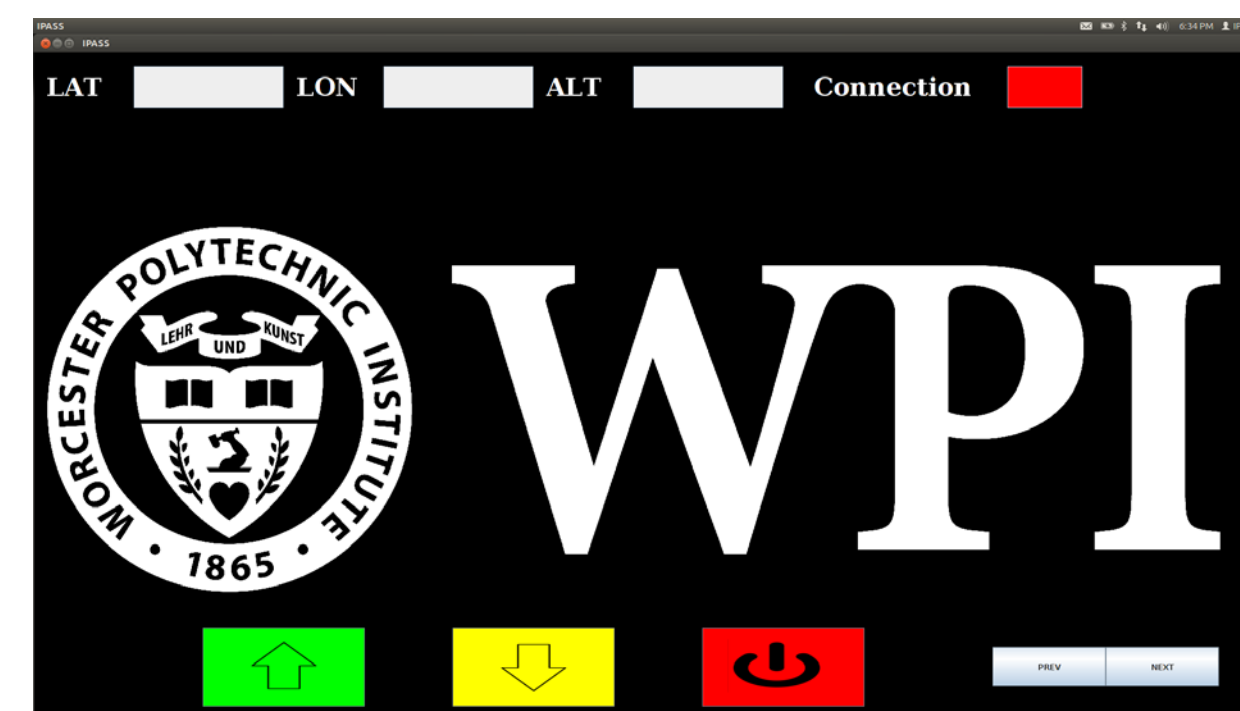


Figure 3 – Operator interface for IPASS

## PROPULSION

- Two motor propeller pairs
- Coaxial and contra-rotating to create a single force vector and arrest rotation
- Brushless DC motors for increased longevity



Figure 4 – a) Actual motors used in the IPASS, b) Actual propellers used in the IPASS c) CAD model showing the mounting of the propulsion system

## MANUFACTURING AND ASSEMBLY

- Lightweight disposable Coroplast frame
- Durable Delrin electronics box
- Rapid Prototyped ABS top cone and camera mount
- Toolless assembly in under 10 minutes

## FIELD TESTING

- Drop tests to evaluate survivability
- Launch tests to evaluate stability
- Electronics box tests to evaluate functionality



Figure 5 – Flight test, stability issue



Figure 6 – Photograph of fully assembled IPASS

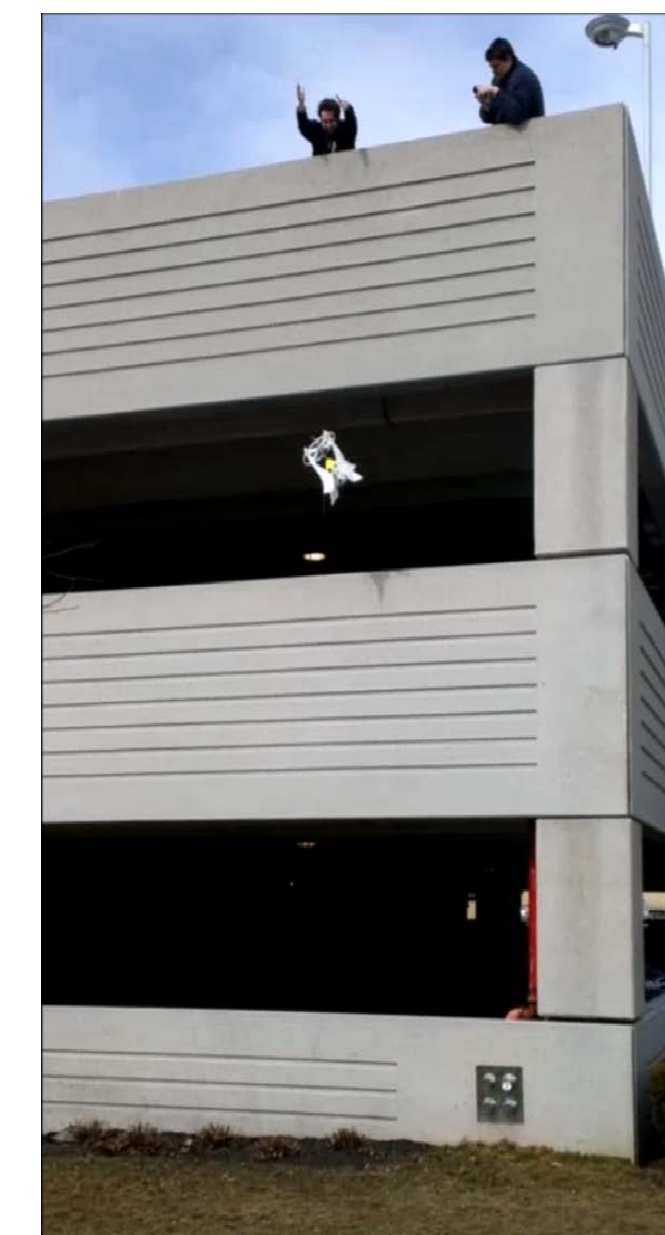


Figure 7 – Drop test from 30ft