DESIGN OF AN AUTONOMOUS PLATFORM FOR SEARCH AND RESCUE UAV NETWORKS

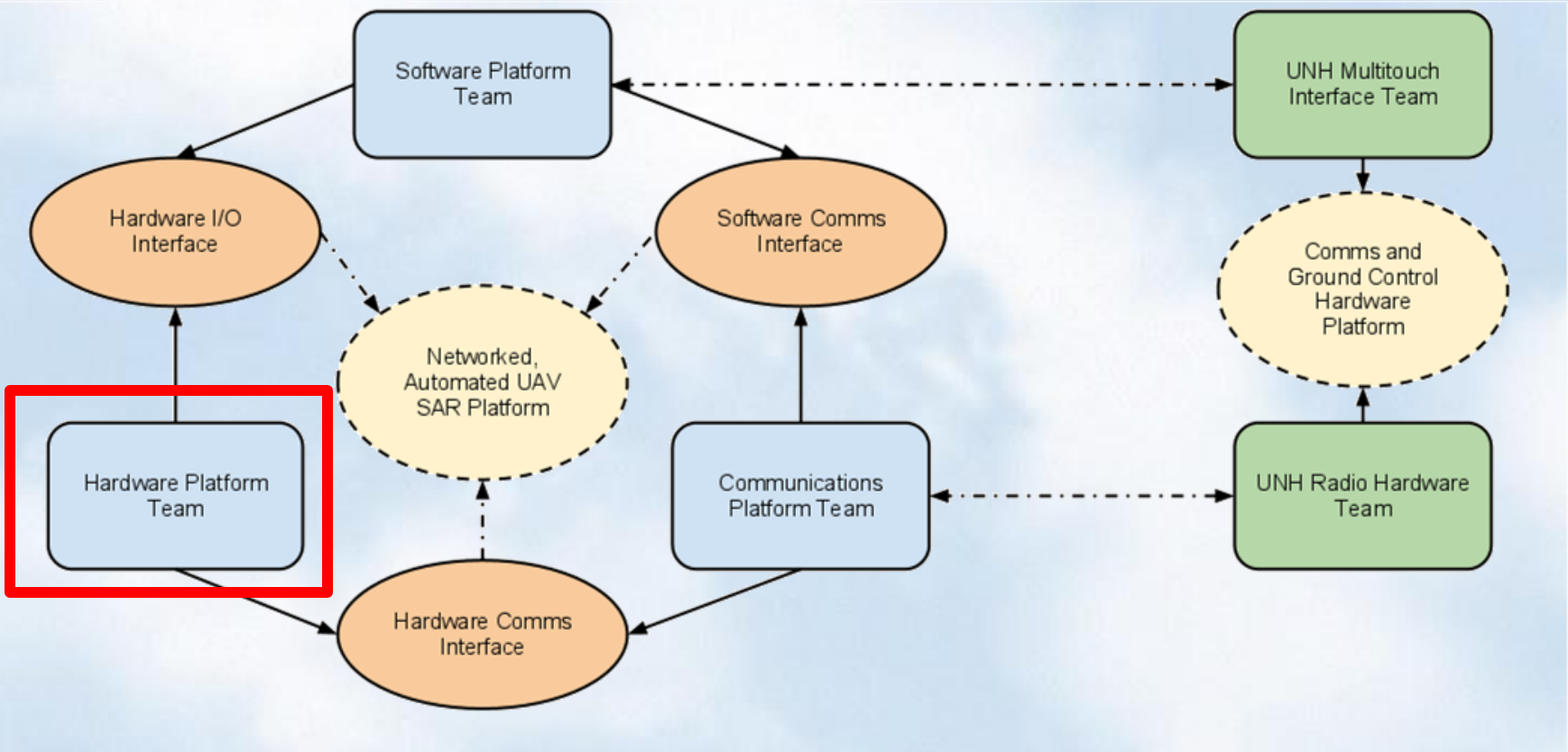
Group Members:

Catherine Coleman, RBE/ME
Joseph Funk, ECE
James Salvati, RBE/ECE
Christopher Whipple, RBE

Advisors:

Professor Padir
Professor Wyglinski

Project Organization



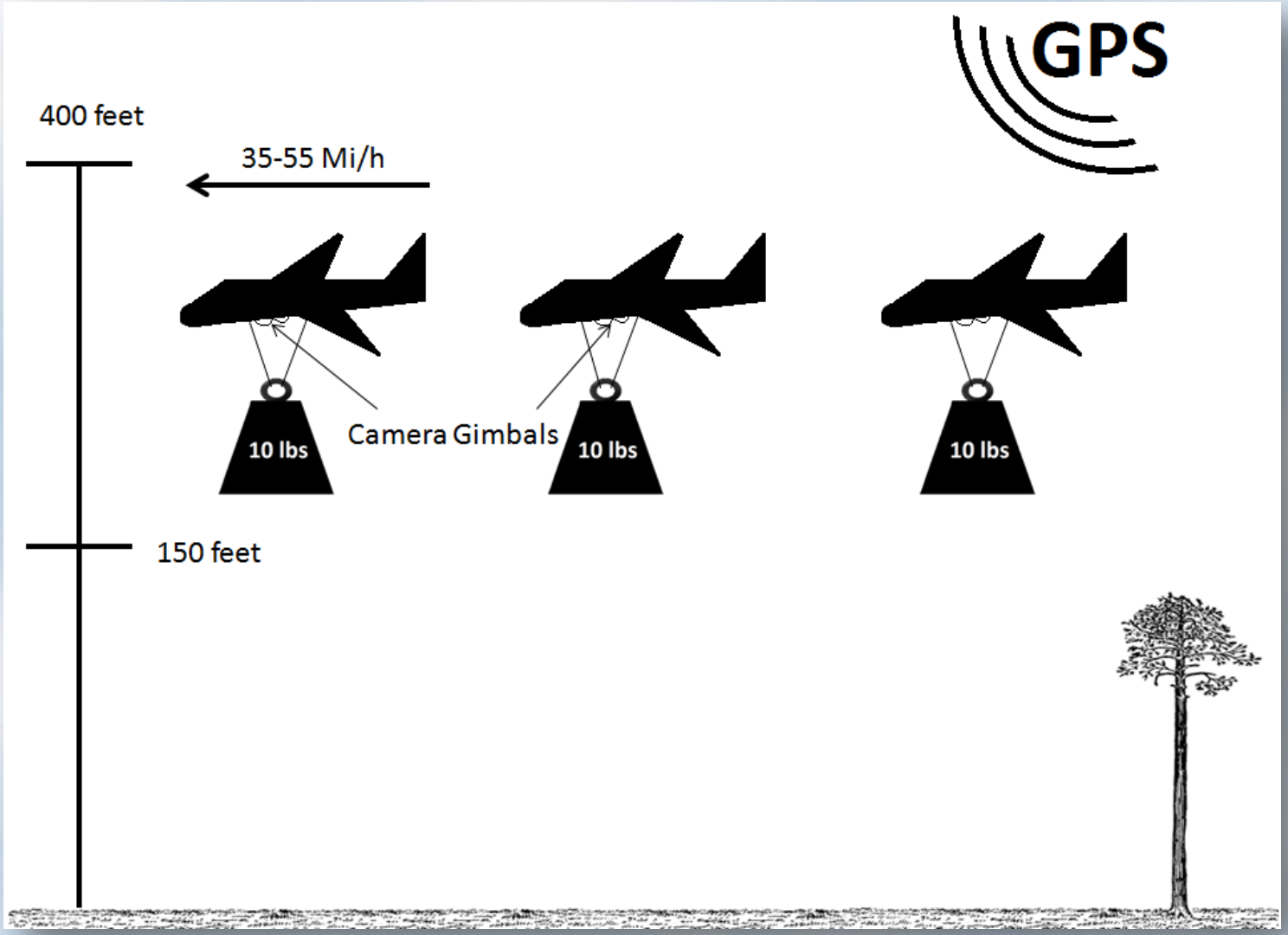
Search and Rescue

"A Search and Rescue volunteer who has completed our Academy will have over 220 hours of Search training prior to responding to missions."

San Diego County Sheriff's Department

Images from http://www.epcsar.org/

Design Specs



Airframes

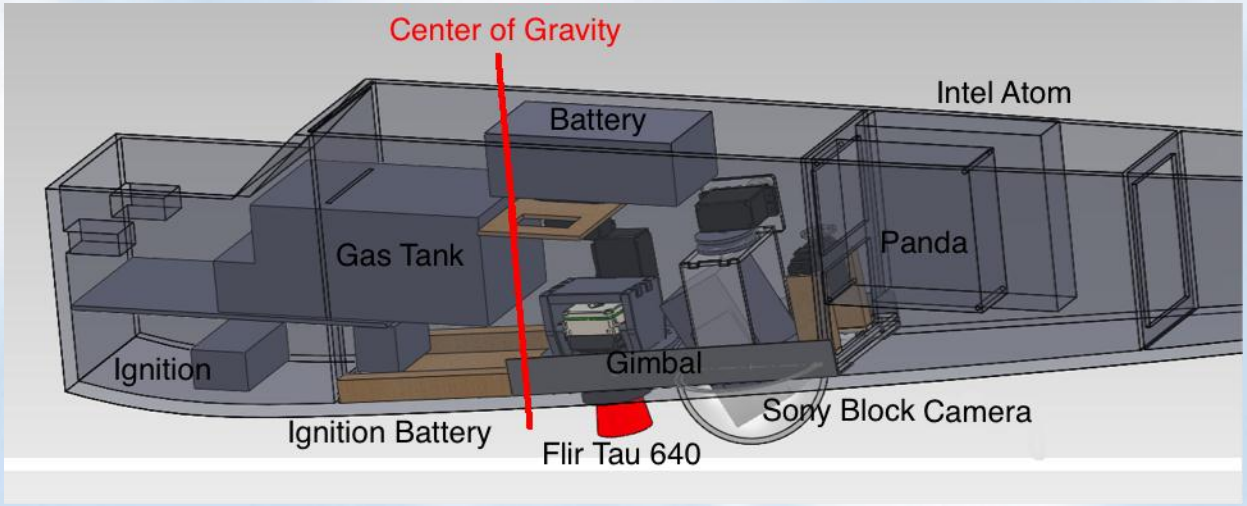
"Goose"

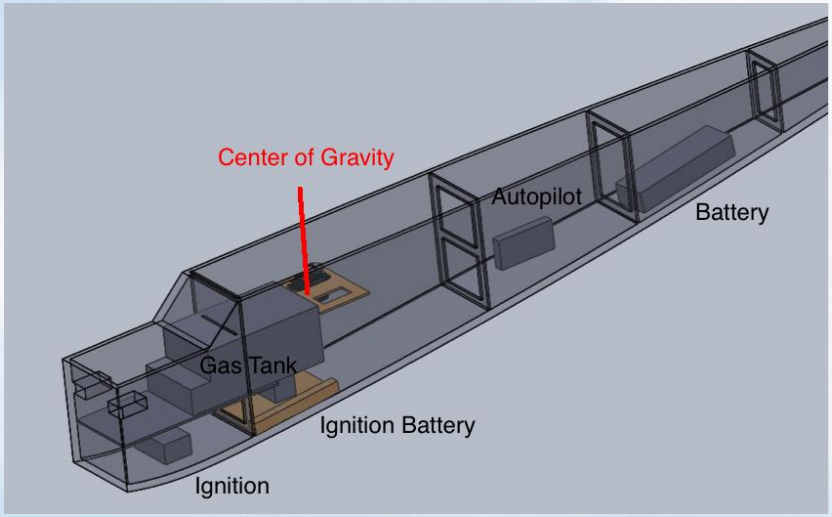
"Blue Jay"

"Red Robin"

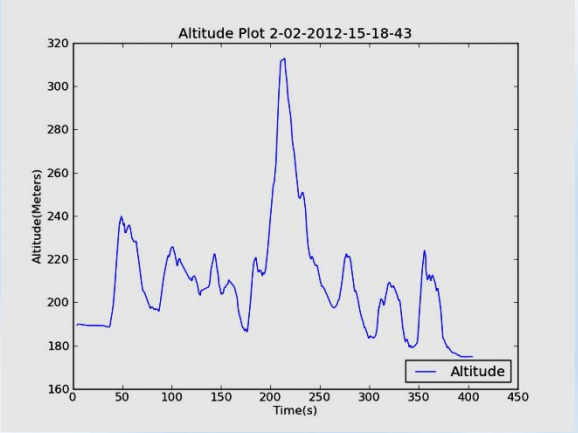
"Duck"

Layout

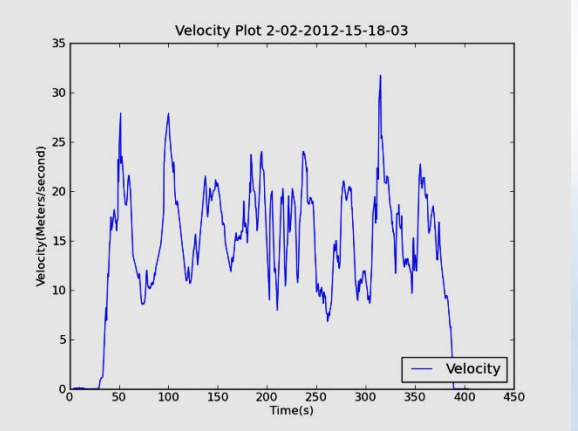

Center of Gravity
Intel Atom
Battery
Gas Tank
Panda
Ignition
Gimbal
Sony Block Camera
Ignition Battery
Flir Tau 640


Center of Gravity
Autopilot
Battery
Gas Tank
Ignition Battery
Ignition

Flight Results



Altitude Plot



Velocity Plot

Camera Gimbal

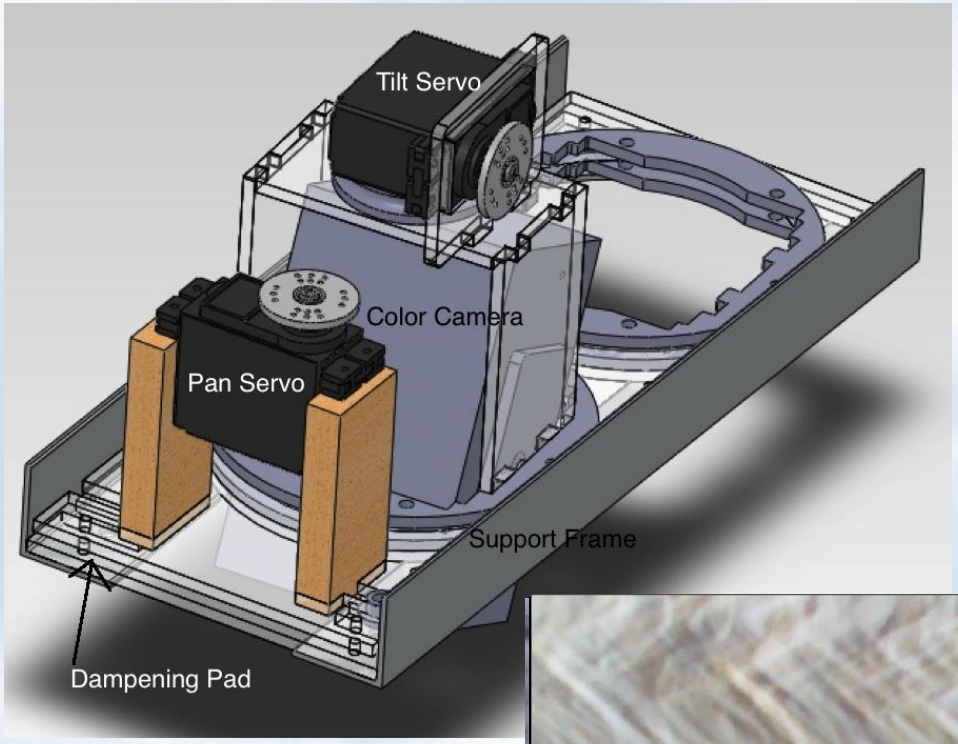


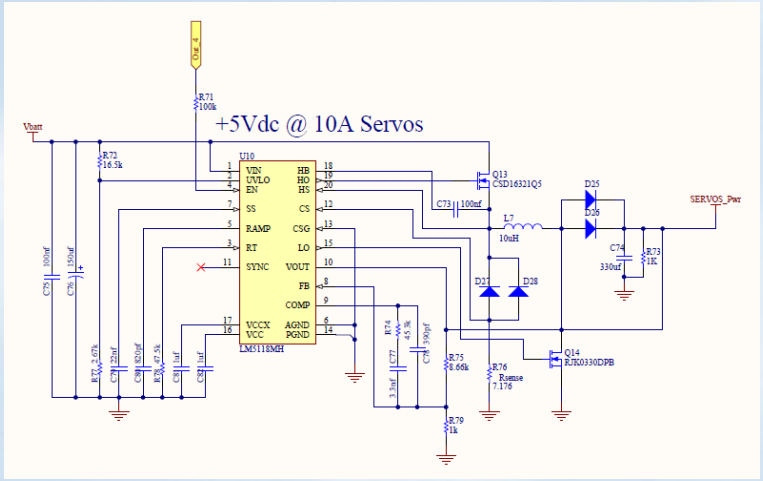
Image with Dampening

Images without Dampening

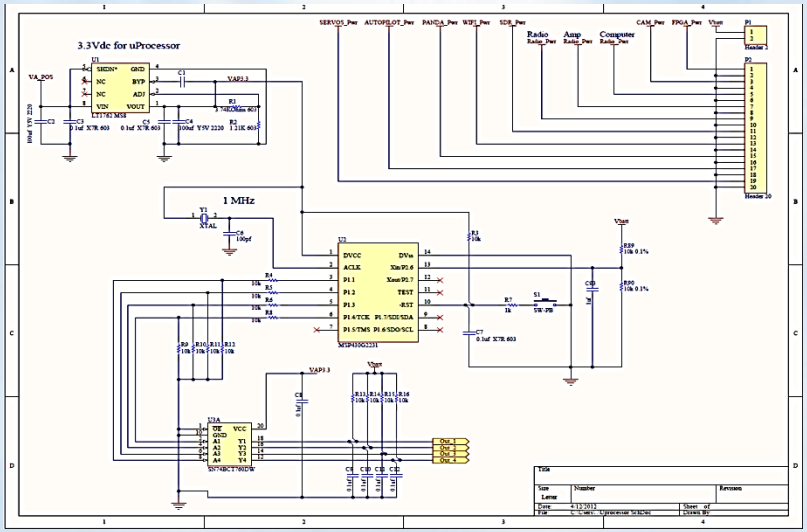
Power Board

- MSP control logic
- Initial estimates between 90-95% efficient
- Flexible battery input

System	Voltage	Current	Allowed Power	Priority level*
FPGA Power	5 V	5 A	25 W	4
Camera	6 V	.5 A	3 W	4
SDR Amplifier and Computer	5 V	4 A	20 W	3
SDR	6 V	3 A	18 W	3
WIFI	15 V	.8 A	12 W	2
Panda	5 V	1 A	5 W	2
Autopilot System	8 V	.5 A	4 W	1
Servos	5 V	3 A	15 W	1
Total			102 W	

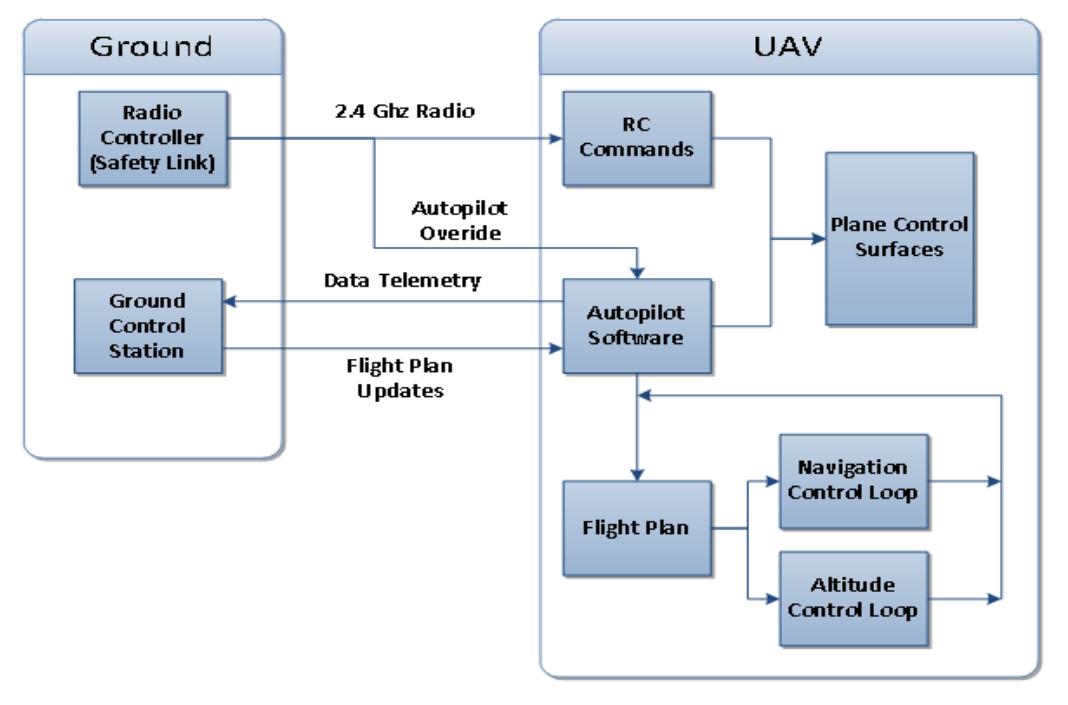


Regulator Circuit



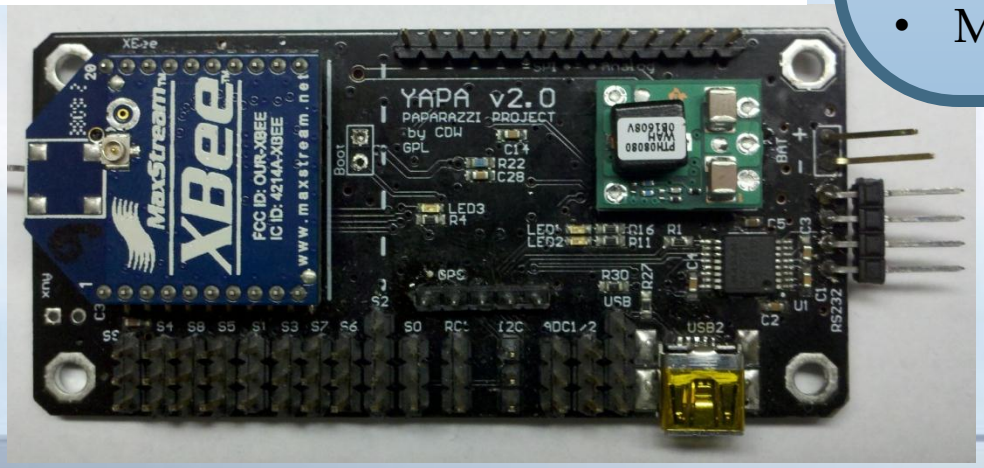
Control Logic

Autopilot Control

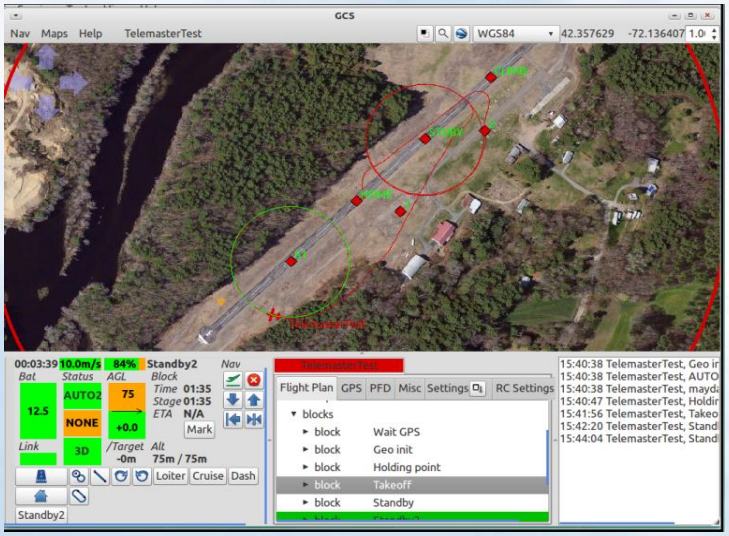


Paparazzi Autopilot System

- Ground Control Station (UI)
- Radio Control Manual Override
- Incremental Testing
  - Auto 1
  - Auto 2
- Radio Telemetry
- Multi Plane Connection

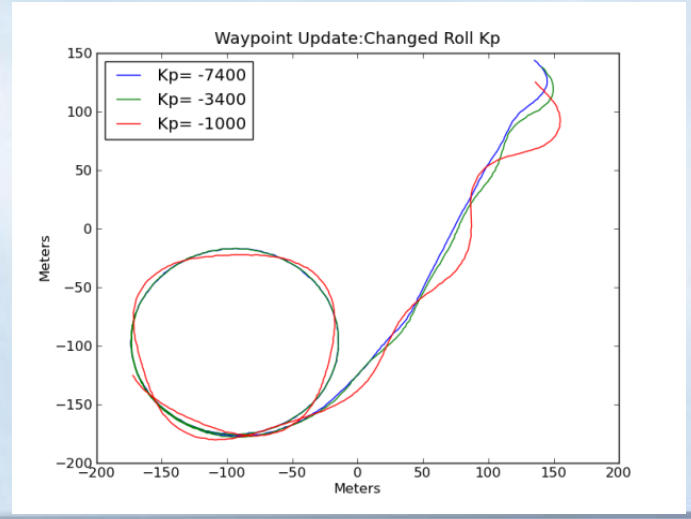


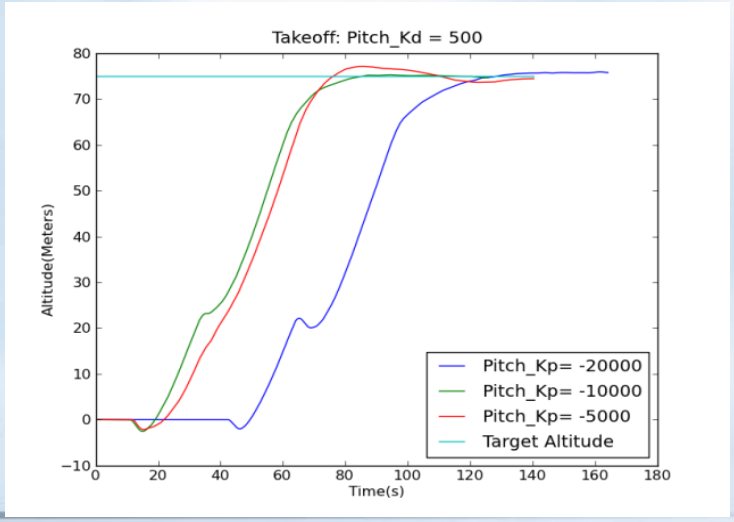
Autopilot Simulations



Roll Navigation Simulation

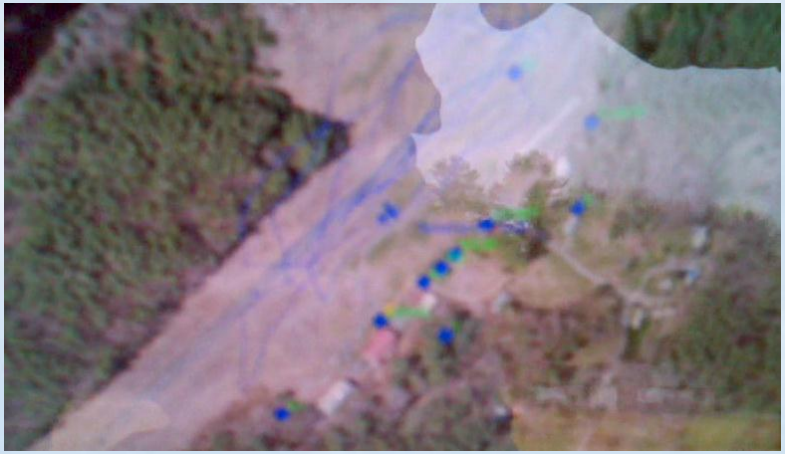
Launch Altitude Simulation

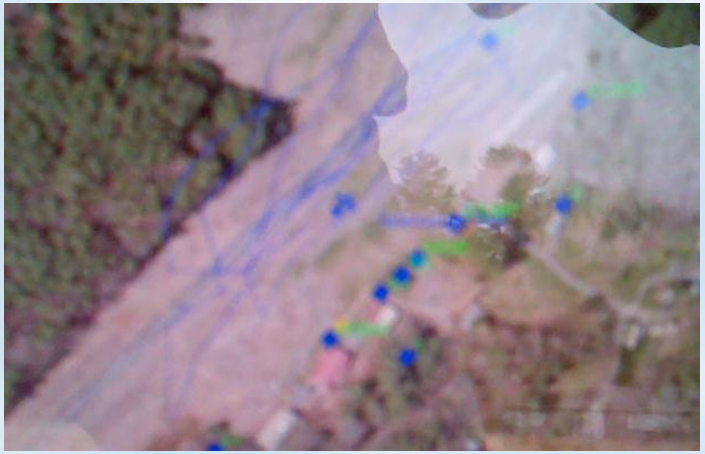




Autopilot Results

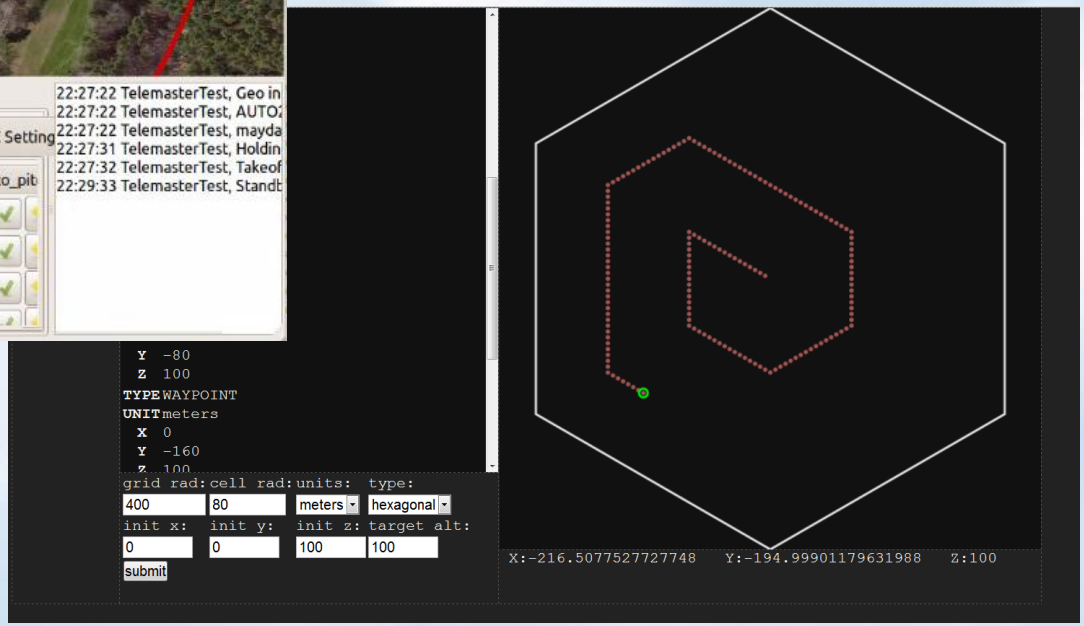
- Sensor Configuration
- Data Acquisition
- 2 Manual Mode Flights
- 1 Auto 1 Engagement
- Multi-board Connection





Navigation Integration

Waypoint Insertion



Flight Results

D	Goal	Outcomes	Resulting Changes
Nov 13	Robin RC Flight	-Engine stalled in final flight, planes steered right	-Altered engine mount thrust angles and pressure gas tank -Moved the gas tank back 4 inches
Feb 2	Robin RC Flight	-Successful GPS downlink -Wings shifted and sheered off wing struts connection	-Added Aluminum Frame and hard mount point for wings -Mounted the IR sensors
Feb 9	RC Flight Decoder Board	-Calibrated thermo sensors on plane	-Replaced the broken wheel
Feb 15	Auto 1	-Lost the down link before going into Auto 1	-Added New decoder board
Feb 18	Auto 2	-Caught a cross wind and **crashed**	-Fixed all crash damage, replaced glue on tail and installed the dome
Apr 7	Jay Flight Auto 1/2	- Too windy, taxi test only	-NA
Apr 11	Jay Flight Auto 1/2	-Jay flew, slight warp in right wing discovered -Only **half of Robin returned**	- to be continued…..

Planes in Action

Design of an Autonomous Platform for Search and Rescue UAV Networks

Catherine Coleman, Joeseph Funk, James Salvati, Chris Whipple
Advisors: Taskin Padir, Alexander Wyglinski

WPI Robotics

Where We Stand

- **Robin**
  - RC flight
  - Auto 1 flight
  - Crash, need airframe replacement
- **Jay**
  - RC flight
- **Duck**
  - Some assembly required
- **Integration**
  - External waypoint insertion
  - Power board designed

New England Undergraduate Computing Symposium 2012

PROJECT WIND WOULD LIKE TO GIVE A SPECIAL THANKS TO:

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WPI
Sterling Airport
Professor Fred Looft
Professor John Hall
Professor Alexander Wyglinski