Team 8 AUVSI

DESIGN COMPETITION

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Agenda

- Project Overview & Background
- Progress
- Future work
  - Manufacturing and Assembly
  - Stabilization Testing
- Budget
- Schedule
- Final Summary

Overview

"The goal of this project is to work effectively as an international team to create the best possible aircraft for future success at the 2016 AUVSI SUAS Competition.“

FIPSE- Fund for the Improvement of Postsecondary Education

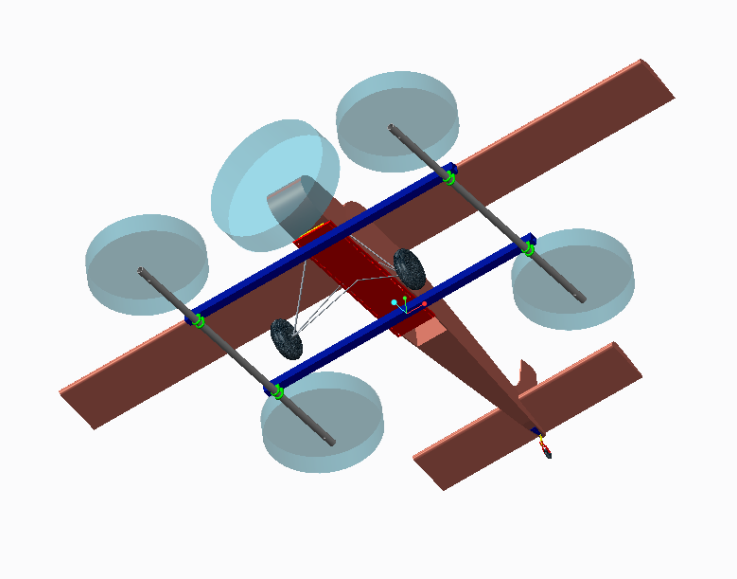
- Gained knowledge of international cooperations

Tasks:

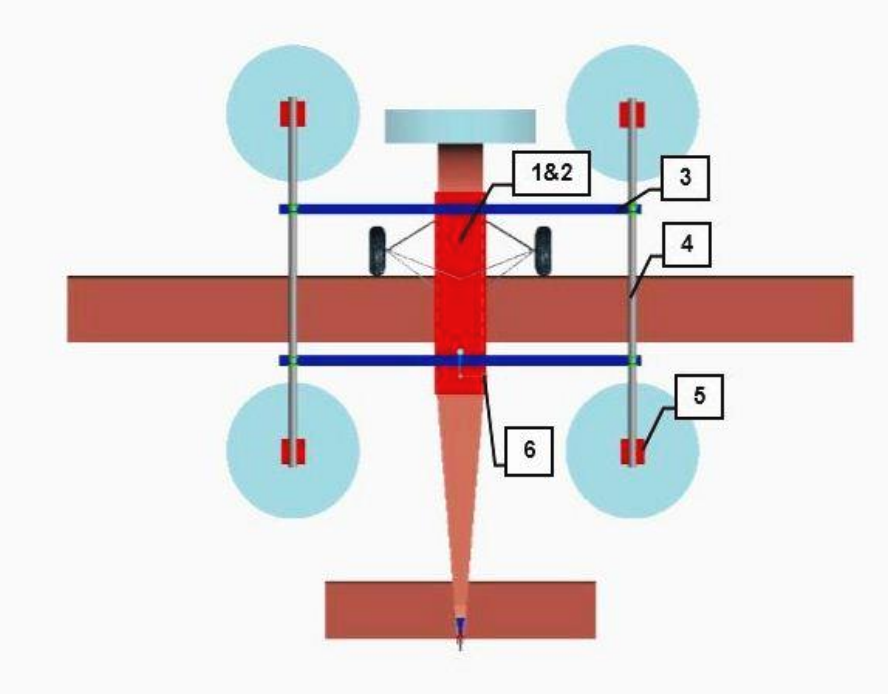
- **Design** aircraft, optimizing for competition
- **Build** and modify existing Senior Telemaster plane
- **Program** aircraft for automated VTOL and waypoint navigation
- **Test** aircraft and adjust accordingly

Background

- Chose to design hybrid vehicle
  - Vertical takeoff and landing
  - Decrease space of takeoff and landing
  - Hovering Capabilities
  - Flight time
- Optimal vehicle for AUVSI competition
- Innovative design
  - Allows team to separate itself from other competitors



Final Design



Material Selection:

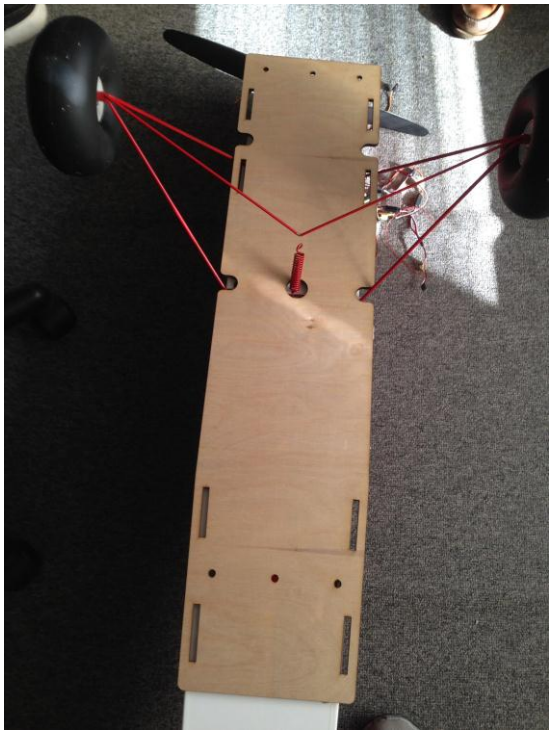
1. ¼” Plywood for the Base
2. Quick-Recovery Polyurethane Foam
3. 6061 Aluminum Cross Beams
4. High-Strength Rigid Carbon Fiber Rods
5. G-10 Garolite Motor Mounts
6. Industrial Strength Velcro to Attach

Quadcopter Selection:

- 4 Cobra 4510 420KV DC Motors
- 4 APC 18”x5” props (2 CCW and 2 CW)
- Cobra 60A ESC
- Venom Flight Pak 5000mAh

Progress

- All final design parts ordered and in possession
- Base material was changed from G-10 Garolite to plywood
  - Decreased weight
  - Easier to machine (laser cut)
  - No high loads on part just attachment point between plane and cross beams
- Base has been machined
- Drawings complete and waiting on machining
- Researched testing apparatus, methods and identified future work



Assembly of Plane and Elec.

- Parts being manufactured and assembled
- Electronics being wired and assembled
    - Measurements
    - Connections and Tests
- Plane assembly
    - Pieces missing or broken from last years plane
- Solutions to broken parts
    - 2 new APM 2.6, one for vertical flight and one for horizontal flight
    - New 3DR Telemetry Kit
    - Possible new receiver for VTOL

Stabilization Testing

Purpose:

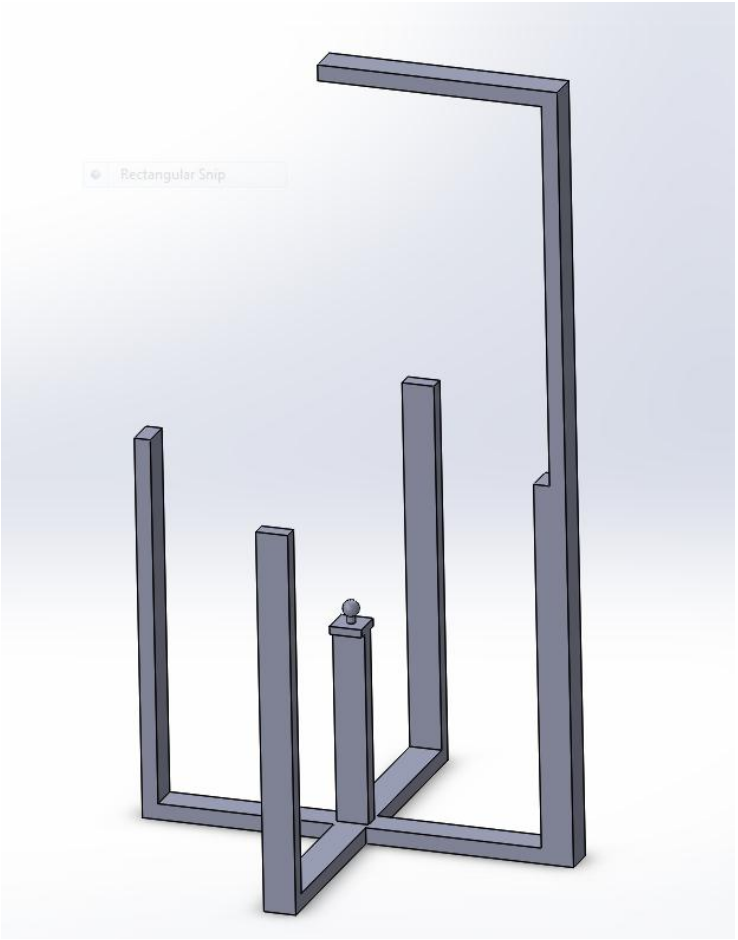
- To ensure autopilot system can self stabilize un-symmetrical design and if not, what adjustments might be needed.

Testing Vehicles

- Quadcopter
- Hybrid Vehicle

Goal:

- To analyze the data collected from mission planner and determine that self stabilization has occurred.



Scaling for Quadcopter

- We want to scale our Final Design to test stabilization and control with a *Dynamically Similar* Quad copter
  - Motor-to-motor dimension is defined for both
  - Total torque from motors is defined for both
  - Total Weight is defined for the final design but variable for the Quad.
- Issues:
  - Linear scaling not possible; must keep Torque-Weight ratio and motor-to-motor lengths
- Solution:
  - Currently using Dynamic Scaling methods to find proper mass proportional to thrust and length

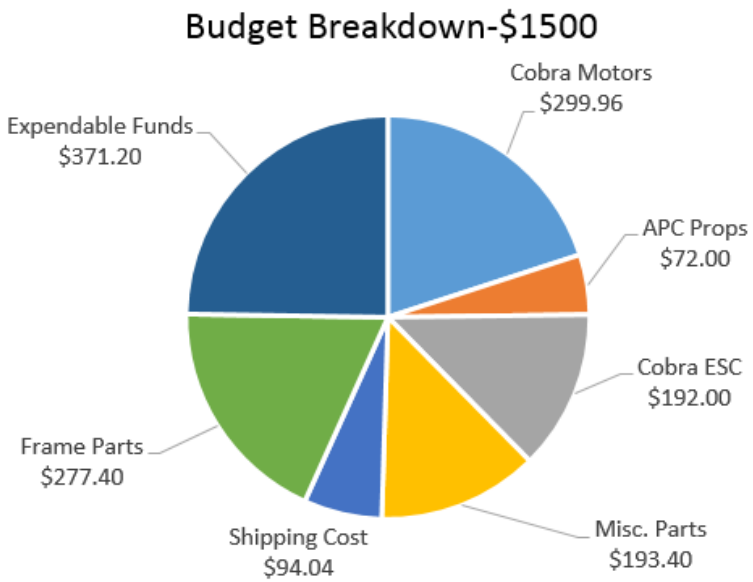
	Final Design	Quadcopter	Scale Factor
M-to-M Length	100cm	38cm	0.38
Thrust	26.48kg	5.52kg	0.21
Mass	10.92kg	?	dynamic scaling

Scaling for Quadcopter

Testing Plan

- Unique design requires extensive testing to prove unsymmetrical airframe airworthiness and control stability.
- Objectives
  - System functionality
  - Stability
  - Vertical Lift
  - Forward Flight
  - Ground Effects
  - Hovering Height
- Data: Height, heading, velocity, and response time of aircraft control
- First scale model will undergo testing, next will be hybrid vehicle

Cost Analysis

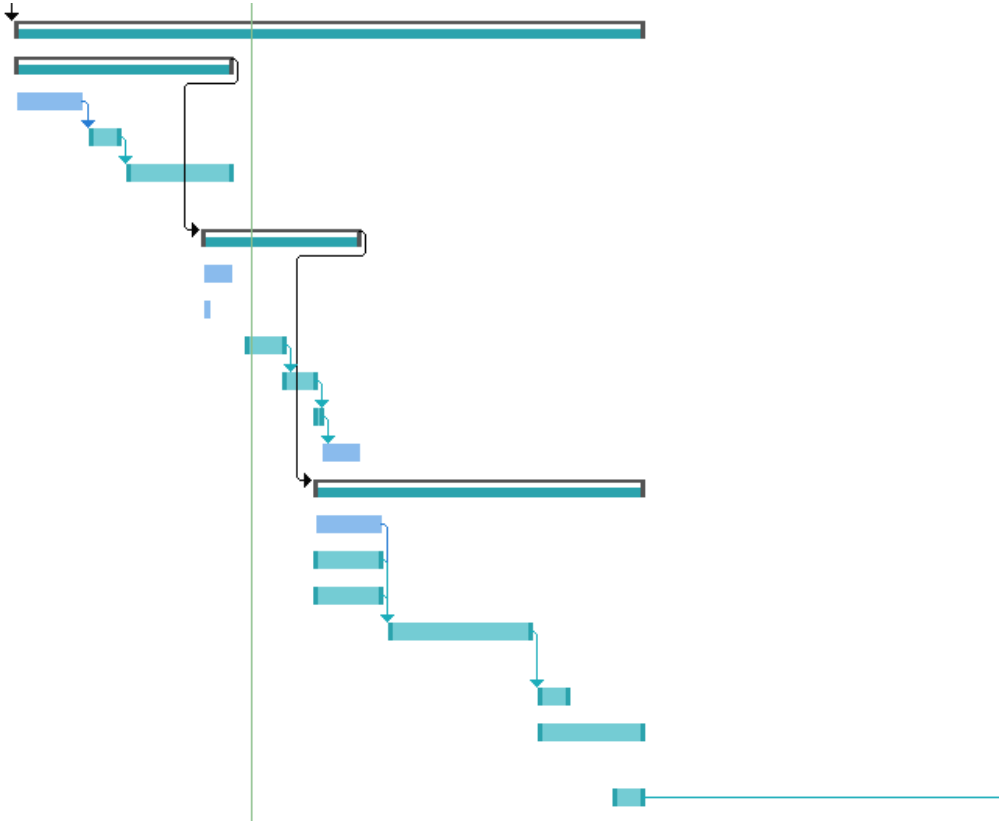


Analysis:

1. Utilized 75% ($1128.80) of budget
2. Efficient Spending
3. Surplus Added
4. Enough expendable funds to purchase a new autopilot and 3DR Telemetry kit

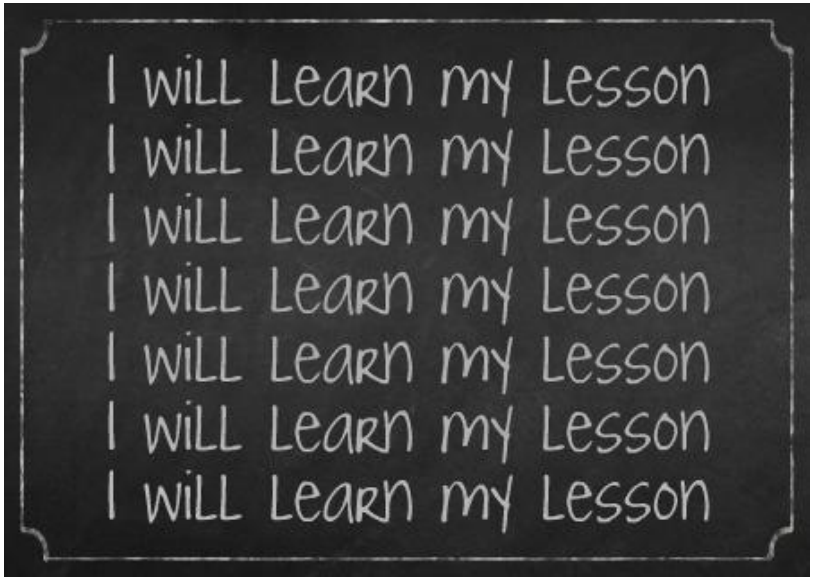
Schedule/Gantt Chart

Spring Semester 2015	**17 wks**	**Mon 1/5/15**	**Fri 5/1/15**
Machine Parts for Design	**6 wks**	**Mon 1/5/15**	**Fri 2/13/15**
Receive parts for design	2 wks	Mon 1/5/15	Fri 1/16/15
Complete drawings for design	1 wk	Mon 1/19/15	Fri 1/23/15
Submit parts to be machined and have machined	3 wks	Mon 1/26/15	Fri 2/13/15
Stabalization Test	**4.2 wks**	**Mon 2/9/15**	**Mon 3/9/15**
Assemble Quad Copter	1 wk	Mon 2/9/15	Fri 2/13/15
Create Scaled Frame	1 day	Mon 2/9/15	Mon 2/9/15
Calibrate Quad Copter	1 wk	Tue 2/17/15	Mon 2/23/15
Self Stabilization With Scale Model	5 days	Tue 2/24/15	Sun 3/1/15
Trouble shoot	1 day	Mon 3/2/15	Mon 3/2/15
Supplemental test if necessary	1 wk	Tue 3/3/15	Mon 3/9/15
VTOL Test	**9 wks**	**Mon 3/2/15**	**Fri 5/1/15**
Build Frame and Attach Motors	2 wks	Mon 3/2/15	Fri 3/13/15
Wire all electrical components	2 wks	Mon 3/2/15	Fri 3/13/15
Build teather system for safety	2 wks	Mon 3/2/15	Fri 3/13/15
Proceed with Test Plans for VTOL and Stability	4 wks	Mon 3/16/15	Fri 4/10/15
Touble Shoot	1 wk	Mon 4/13/15	Fri 4/17/15
Supplemental Test for VTOL/Stability	3 wks	Mon 4/13/15	Fri 5/1/15
Assessment and Future Plans	1 wk	Mon 4/27/15	Fri 5/1/15



Lessons Learned

- Double check parts from previous year
- Use resources better (professors and facilities)
- More accountability
- Detailed Planning



Final Summary

1. Completed final design
2. Manufacturing stage has begun
3. Testing plan for stabilization
4. Quad copter assembly
5. New part acquisition
6. Budget/Schedule

References

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Website:
http://eng.fsu.edu/me/senior_design/2015/team08/