

ME, ECE, IE Capstone Design Programs



31 – FLYING TIGERS – ADVANCED CLASS

SAE AERO DESIGN COMPETITION

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Design Objectives

Design and build a radio-controlled aircraft capable of carrying a static payload while delivering and accurately dropping a number of releasable payloads.

Design Constraints

SAE Competition Rules:

- Minimum Dropping Altitude: 100ft
- Internal Combustion Engine w/ Max Displacement: 0.46in³
- Releasable Payload Weight: 2.00-2.25lbs

FAA Regulations:

- Maximum Weight: 55lbs
- Plane Registered with FAA
- Fly zone limited to pilot's field of vision

Design Overview

- Rectangular Monokote and Balsa Wing
- Carbon Fiber with Foam Core Panels L=36" W=4" H=8.3"
- 57msi Carbon Fiber Square Tube Boom
- Nova Rossi R46F Pylon Racing Engine
- Steerable Nose Gear with Suspension
- 2 – 1.8lb Static Payloads
- 2 – 2lb Releasable Bags
- Carbon Fiber Frame with 28" Wheel Base

Design Specifications

Capacity for 2 – 2lb Releasable Payload Sandbags
Capacity for 3 – 1.8lb Static Payload Steel Rods

Wing Size: 8ft Span; 16in Chord; 10.67ft² Wing Area
Wing Materials:
Carbon Fiber Spar – Balsa Wood Ribs
Monokote Skin

Engine: Nova Rossi R46F Pylon [0.458in³ Disp.]
Electronics:
PixHawk Flight Controller
Savox Digital Servos
5000mAh Li-Po Battery
720p RunCam Eagle Camera

Project Management

2016 Sep Oct Nov Dec 2017 Feb Mar Apr May

- Preliminary Design: 9/9/2016 - 9/30/2016
- Detailed Design: 10/1/2016 - 11/7/2016
- Design Refinement and Testing: 11/8/2016 - 12/5/2016
- Initial Design Manufacturing and Testing: 12/12/2016 - 2/28/2017
- Redesign Manufacturing and Testing: 3/1/2017 - 4/30/2017

	Projected	Actual
Budget	\$ 13,700.00	\$ 13,700.00
Testing Materials	\$ -1,200.00	\$ -1,336.37
Registration	\$ -1,000.00	\$ -1,000.00
First Design Funds	\$ -8,500.00	\$ -5,299.68
Travel and Redesign	\$ -2,500.00	\$ -2,617.76
Budget Surplus	\$ 500.00	\$ 3,446.19

Testing and Validation

Engine Testing

A linear sled pulls on a 3:1 lever arm which transfers force to a scale.
Resulted in Optimized Combination of:
Fuel Type, Propeller, and Glowplug
Produced 9.5lbs of Static Thrust

Fuselage Drop Testing

Fuselage Drop Testing is a FAA standardized test. The plane must fully survive a 9.2" fall to simulate a very rough landing.
Passed Test on 4/5/2017

Flight Testing

Flight tests that the system can operate as a whole. Full testing procedure has the plane take off, turn, drop packages, return to runway, and land safely.
3 Successful Flights out of 6