University of Cincinnati

AeroCats

2015

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WHO WE ARE

The AeroCats are the University of Cincinnati's Competitive Aircraft Design Team. We compete with other colleges from around the world through SAE Aero Design Competitions. 2015's competition will be from March 13-15th in Lakeland, Florida.

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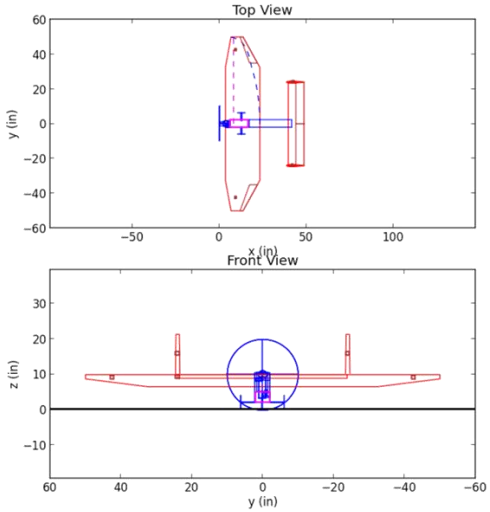
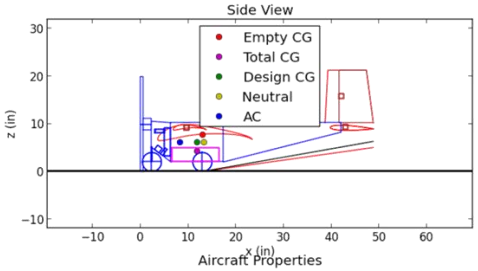
WHAT WE BUILD





Aircraft Properties

Total Weight	41.50 (lbf)
Empty Weight	7.81 (lbf)
Payload Weight	33.69 (lbf)
Ground Roll	194.08 (ft)
Takeoff AoA	8.89 (deg)
L.O. Rate of Climb	132.88 (ft/min)
Max Rate of Climb	160.84 (ft/min)
Overturn Angle < 63	41.76 (deg)
Empty ΔCG_x	1.20 (in)
Payload ΔCG_x	-0.28 (in)

This year our team will design one aircraft to compete in the SAE regular class competition. This class is the most competitive class in SAE Aero Design. The plane must be electric, and its total weight with payload must be less than 55lb. It must also have a length, width, and height sum of less than 175 inches. Teams are judged on flight performance, design reports, and an oral presentation.

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A TRADITION OF SUCCESS

As the capstone to our aerospace engineering education, the construction of our plane is the culmination of five years of hard work. Our teams have historically found great success as we are constantly one of the top ranking teams in the world.

Year	Place
2014	4th
2013	25th
2012	8th
2011	1st
2010	2nd
2009	3rd

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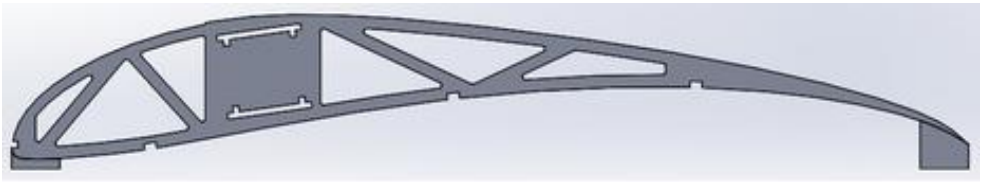

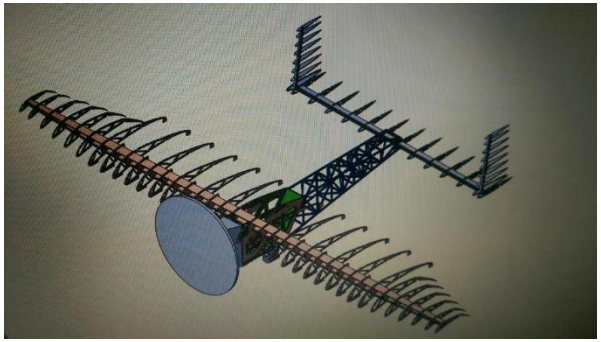

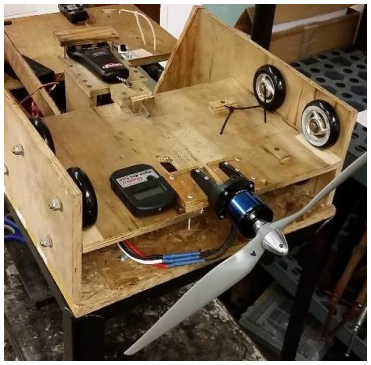

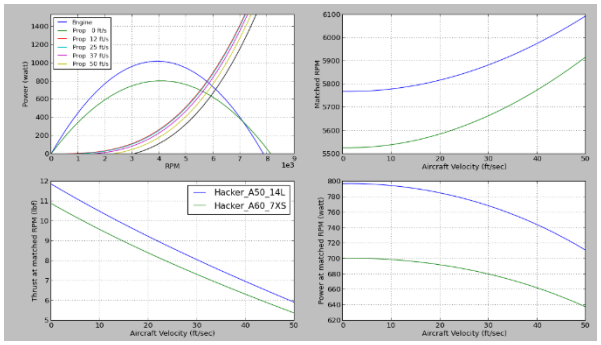

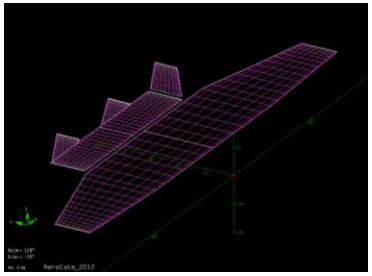

OUR TOOLBOX

Beyond our education, our team is equipped with the latest cutting edge software and technology to aid us in the design process. Some of these technologies include NX Unigraphics, XFLR5, Aerothon, Compufoil 3D and custom built torque and thrust stands.

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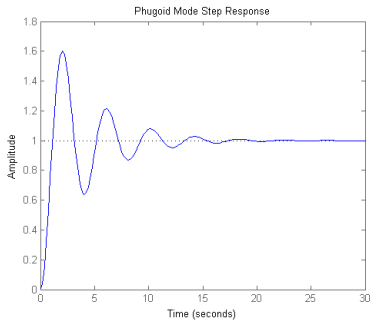
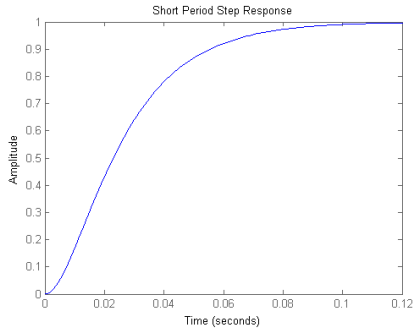
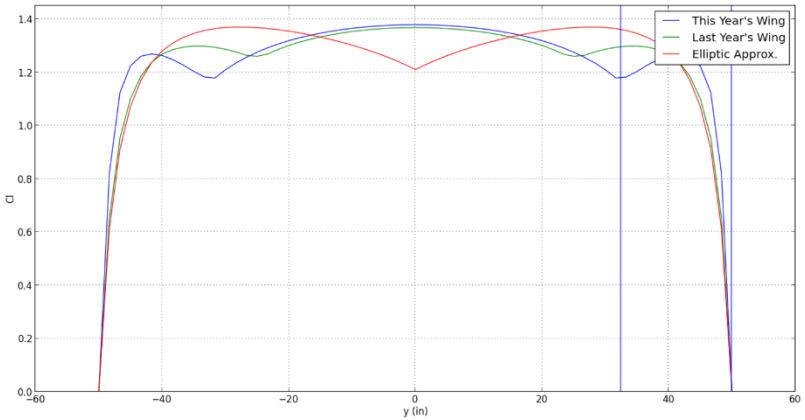
Applying Classroom Material

Item	Stat
Power Draw	940W Continuous
Static Thrust	11.5-12lbf (15-20% increase)
Static Runtime (worst case)	4 minutes







Longitudinal Stability Criteria

	Criterion	Actual			Achieved?
		2013	2014	Current	
Static	Cma < 0	-0.287	-0.911	-0.147	Yes
	x_cg < x_NP	5% SM	15% SM	8% SM	Yes
Dynamic	zeta > 0.04 (Phugoid)	0.14	0.19	0.16	Yes
	0.35 < zeta < 1.3 (Short Period)	1.02	0.91	1.06	Yes

Using last year's data and classroom lessons the team is able to predict the performance of our aircraft. This includes, but is not limited to, propulsion, aerodynamics, and stability and control.

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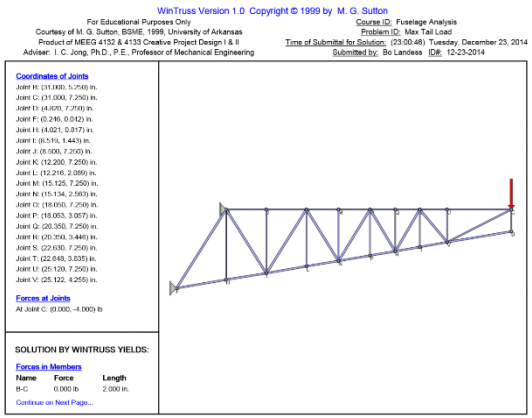
Testing


WinTruss Version 1.0 Copyright © 1999 by M. G. Sutton

For Educational Purposes Only
Courtesy of M. G. Sutton, BSME, 1999, University of Arkansas
Product of MEEG 4132 & 4133 Creative Project Design I & II
Adviser: I. C. Jong, Ph.D., P.E., Professor of Mechanical Engineering

Course ID: Fuselage Analysis
Problem ID: Max Tail Load
Time of Submittal for Solution: (23:00:48) Tuesday, December 23, 2014
Submitted by: Bo Landess ID#: 12-23-2014

Coordinates of Joints
Joint H: (31.000, 5.250) in.
Joint C: (31.000, 7.250) in.
Joint D: (4.620, 7.250) in.
Joint F: (0.246, 0.042) in.
Joint H: (4.921, 0.817) in.
Joint I: (6.519, 1.443) in.
Joint J: (8.500, 7.250) in.
Joint K: (12.200, 7.250) in.
Joint L: (12.216, 2.089) in.
Joint M: (15.125, 7.250) in.
Joint N: (15.134, 2.593) in.
Joint O: (18.050, 7.250) in.
Joint P: (18.053, 3.057) in.
Joint Q: (20.350, 7.250) in.
Joint R: (20.350, 3.446) in.
Joint S: (22.630, 7.250) in.
Joint T: (22.640, 3.835) in.
Joint U: (25.120, 7.250) in.
Joint V: (25.122, 4.255) in.

Forces at Joints
At Joint C: (0.000, -4.000) lb

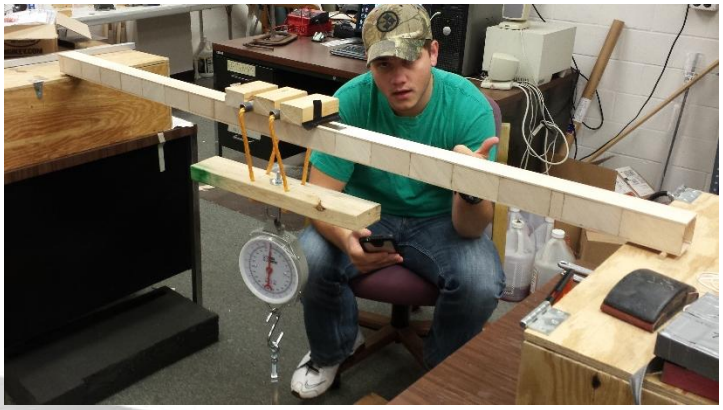
SOLUTION BY WINTRUSS YIELDS:

Forces in Members

Name	Force	Length
B-C	0.000 lb	2.000 in.

Continue on Next Page...

The team has been testing our methods as we progress towards a final design. Shown here (clockwise from upper-right): Testing new engine models for thrust and torque, accelerometer on last year's model with this year's engine choice, load testing the wing spar, and stress analysis of the fuselage design.



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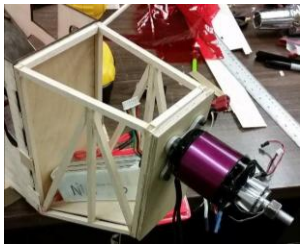
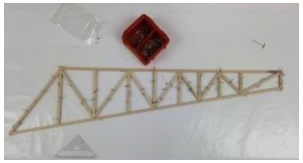
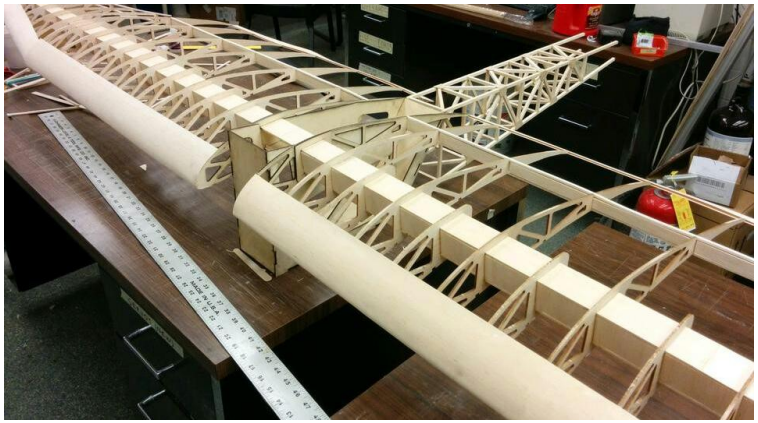
Building







The team has already logged many hours building our first design that will take to the sky the first weekend back of the new year!

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Flight

Since the last update the team has flown this plane 11 times with various payload weights and propellers. This experience provided the team the necessary data to make the final changes to our design before submitting it to SAE. The next step is constructing our final design for competition!

PROJECT BUDGET

Projected Expenses

Registration Cost		Competition Costs		Equipment & Material Cost		Total Proposed Expenses	
						Net	$ 17,475.00
Regular Team	$ 750.00	Travel	$ 3,050.00	Controls Equipment	$ 1,400.00	Additional Safety (10%):	$ 1,747.50
Individual	$ 375.00	Lodging	$ 1,900.00	Shop Tools	$ 600.00		
		Food	$ 3,200.00	Propulsion Equipmnet	$ 3,000.00	**Total:**	**$ 19,222.50**
Total	**$ 1,125.00**			Building Materials	$ 3,200.00		
		Total	**$ 8,150.00**				
				Total	**$ 8,200.00**		

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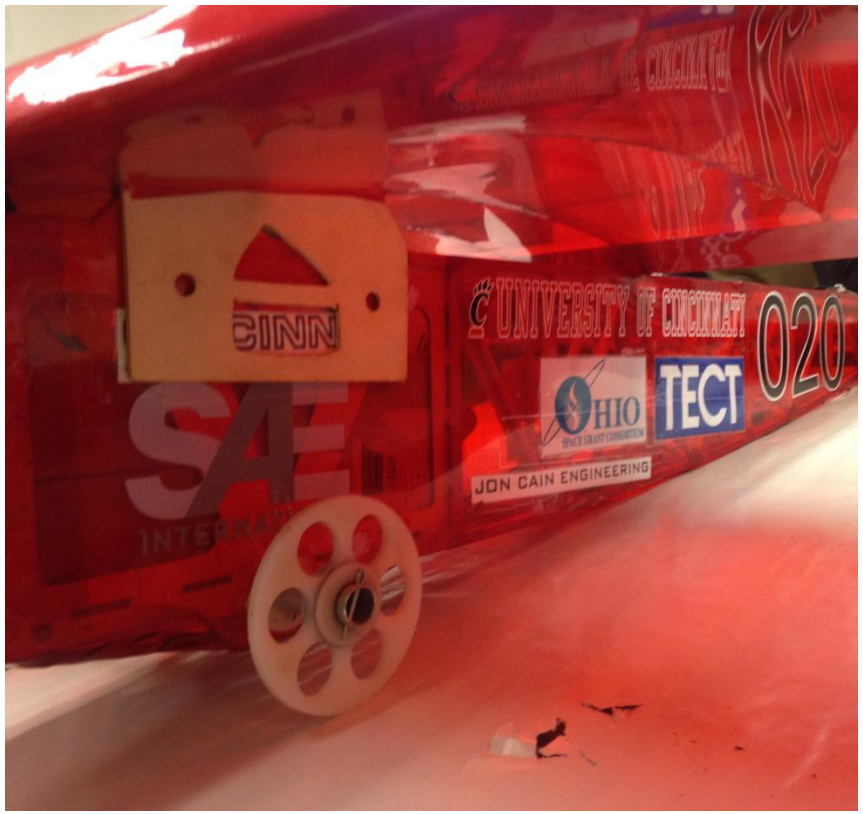
SPONSORSHIP

Your donation can help us further our education into a practical application. To show our gratitude, our team will include a provided logo on our aircraft, and on any signage we produce. Additional sponsorship benefits can be negotiated upon request. Donations are tax deductible and can be sent to:

ATTN: Aerocats
CEAS-Schl Aerospace Systems
Baldwin 745A
2850 Campus Way
Cincinnati, OH, 45221



THANK YOU

Contact us at:
Aerocats2015@gmail.com

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