



Spring Midterm Presentation



FCAAP: AIAA Design Build Fly

Instructor

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Sponsor

FCAAP

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[2/12/13]





Project Overview

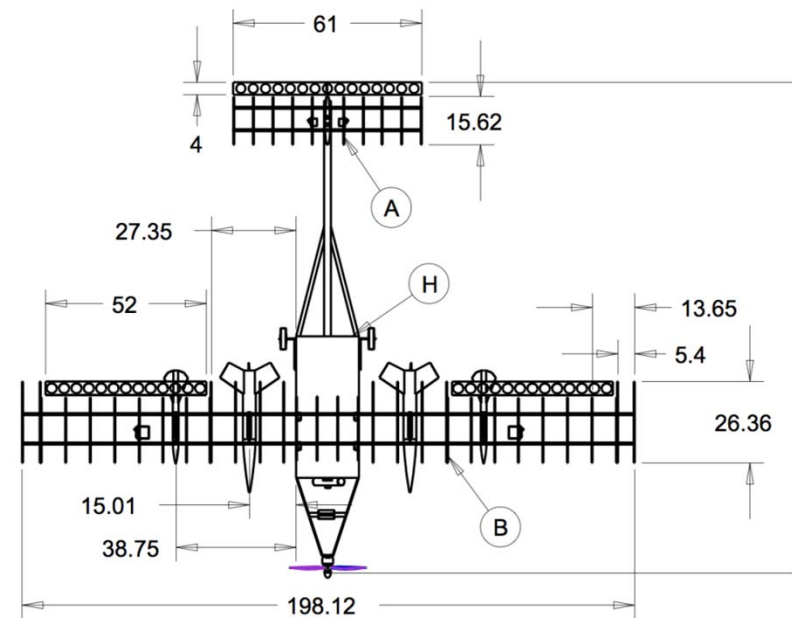
- Remote Piloted Aircraft Design Competition
- Must Design/Build/Fly RC Plane
- Score based upon Three flight missions, aircraft parameters, and written report.
- Mission 1: Max completed laps in given time
- Mission 2: Max internal stores for 3 laps
- Mission 3: Random missile configuration
3 laps, minimum time



Presentation Outline

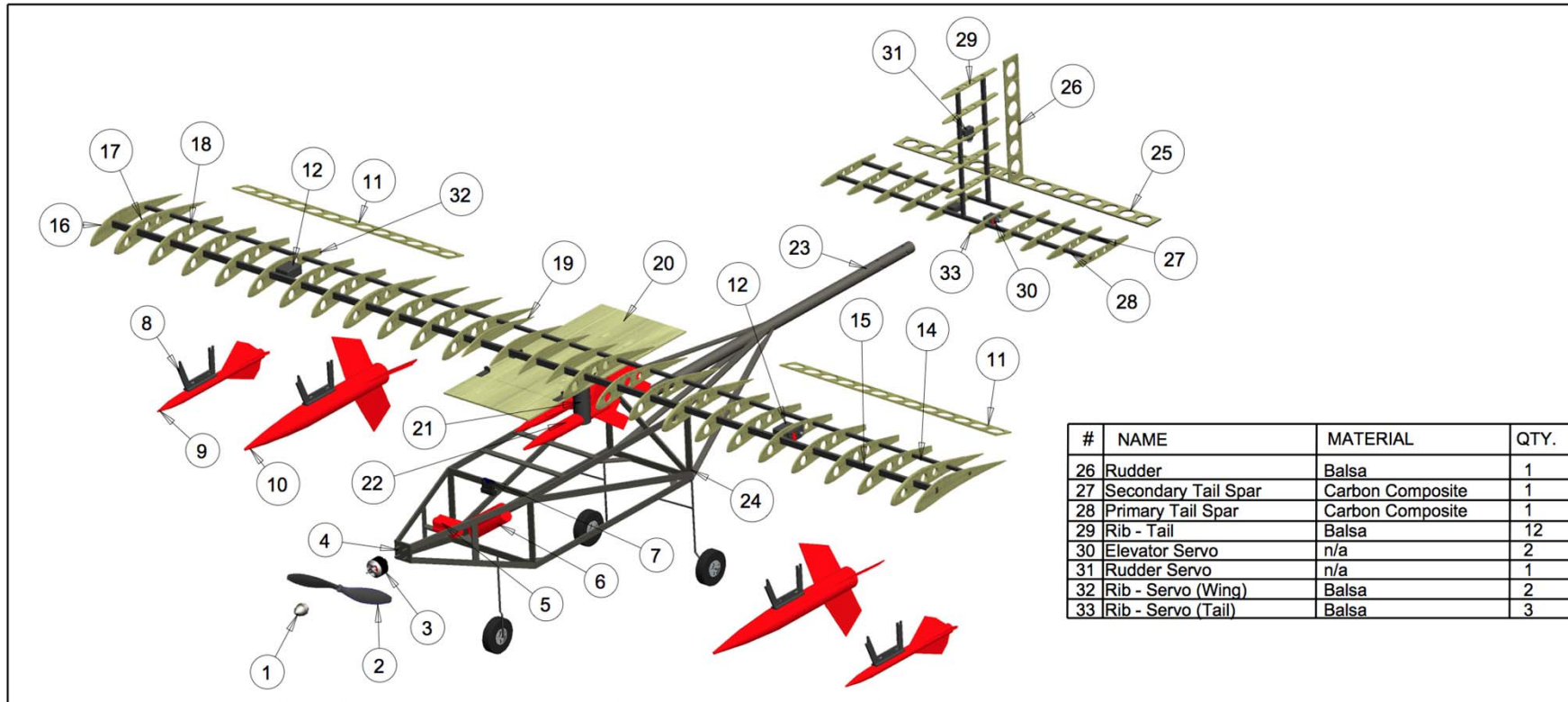


- **Construction Process**
 - Fuselage / Tail
 - Internal Store Assembly
 - Main Wing
- **Propulsion Circuit**
 - Challenges
 - Solutions
- **Future Work**
 - Electronics Integration
 - Exterior Coating
 - Flight Test
- **Schedule**





Build Process



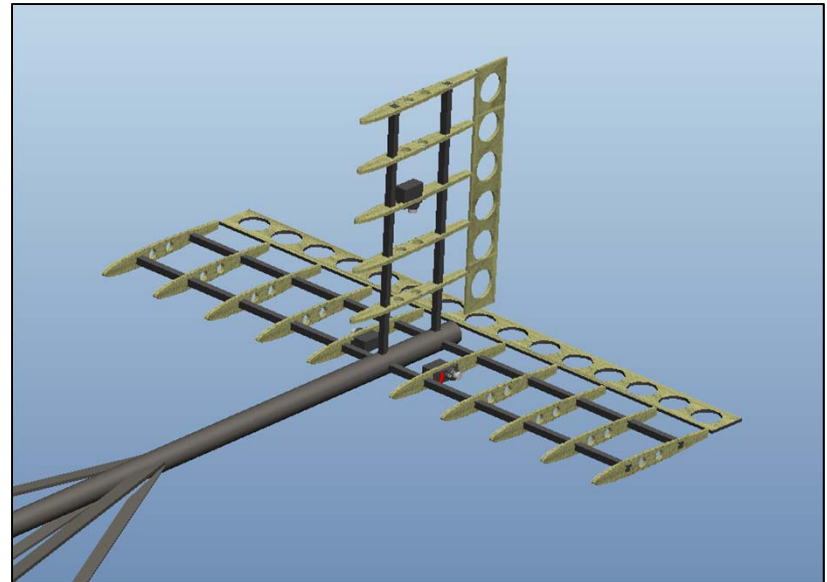
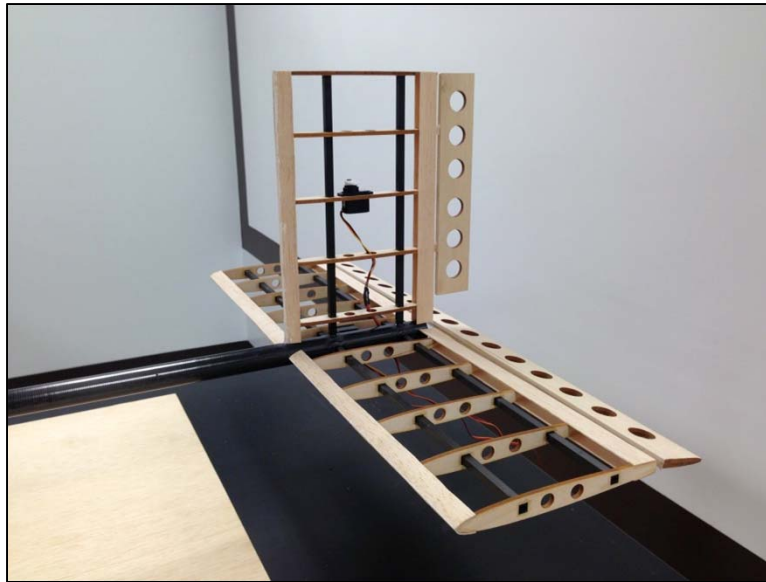
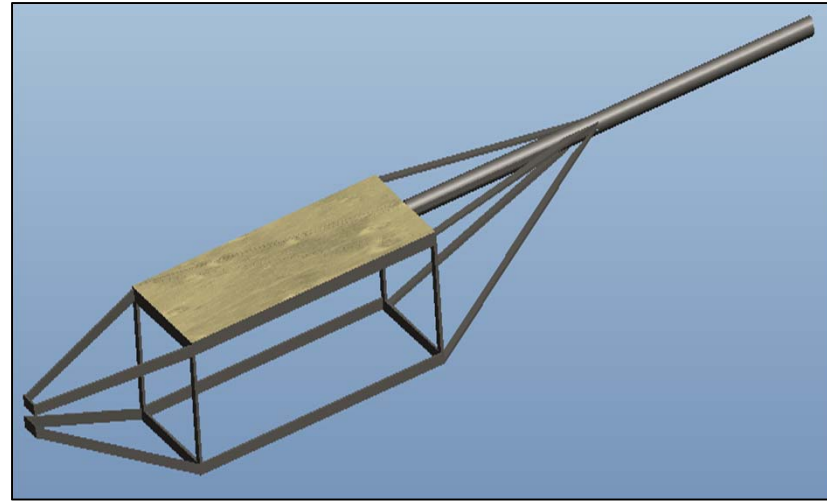
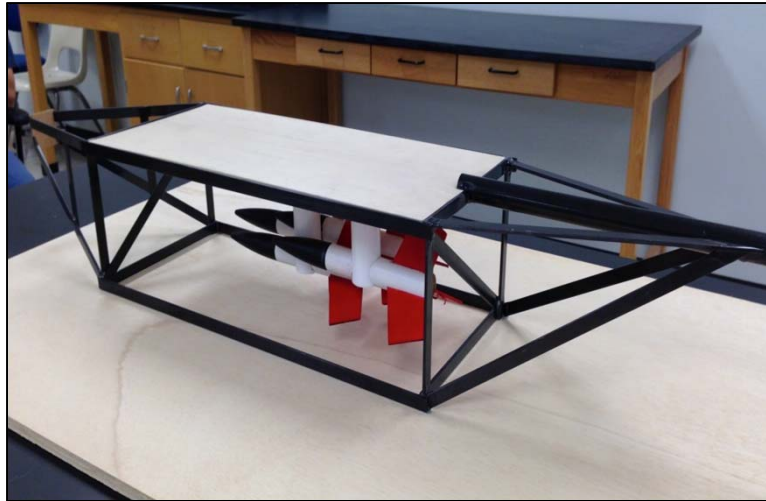
#	NAME	MATERIAL	QTY.
26	Rudder	Balsa	1
27	Secondary Tail Spar	Carbon Composite	1
28	Primary Tail Spar	Carbon Composite	1
29	Rib - Tail	Balsa	12
30	Elevator Servo	n/a	2
31	Rudder Servo	n/a	1
32	Rib - Servo (Wing)	Balsa	2
33	Rib - Servo (Tail)	Balsa	3

#	NAME	MATERIAL	QTY.	#	NAME	MATERIAL	QTY.
1	Propeller Chuck	Aluminum	1	14	Secondary Spar	Carbon Composite	1
2	Propeller	Plastic	1	15	Primary Spar	Carbon Composite	1
3	Electric Motor	n/a	1	16	Rib - Wing End	Balsa	2
4	Motor Mount	Carbon Composite	1	17	Rib - Regular	Balsa	12
5	Battery Pack (Servo)	n/a	1	18	Rib - Aileron	Balsa	14
6	Battery Pack (Motor)	n/a	1	19	Rib - Fuselage	Balsa	4
7	20 Amp Fuse Holder	n/a	1	20	Fuselage Top	Basswood	1
8	External Store Att.	Carbon Composite	4	21	Internal Store Att.	Plastic	4
9	HiFlyer Rocket	n/a	2	22	MiniMax Rocket	n/a	4
10	DerRedMax Rocket	n/a	2	23	Tail Tube	Carbon Fiber	1
11	Aileron	Balsa	2	24	Fuselage	Carbon Composite	1
12	Aileron Servo	n/a	2	25	Elevator	Balsa	1

NOTE: ALL DIMENSIONS IN CENTIMETERS	FAMU FSU COLLEGE OF ENGINEERING CESSNA-RAYTHEON-AIAA DESIGN/BUILD/FLY 2013		
	DOCUMENT TITLE		
STRUCTURAL ARRANGEMENT			
TEAM NAME	DATE APPROVED	REPORT TITLE	SIZE
PEGASUS	02/19/2013	DRAWING PACKAGE	B
DRAWN BY	SCALE	SHEET NUMBER	
WILL WATTS	0.100	2 of 4	



Fuselage and Tail

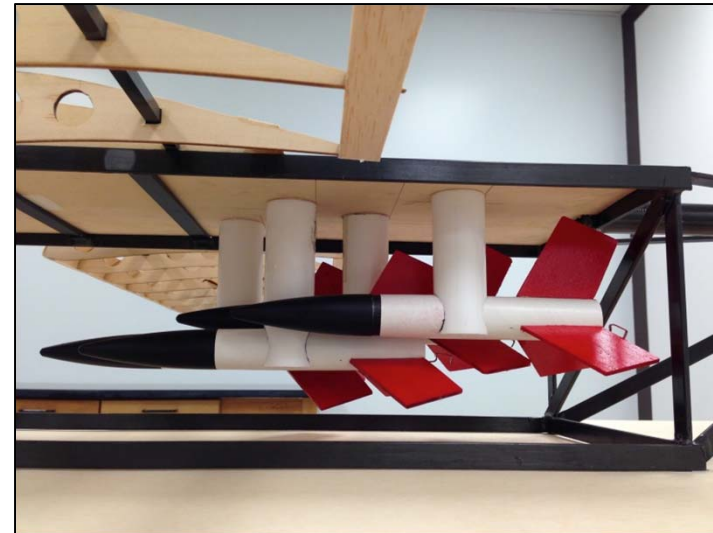
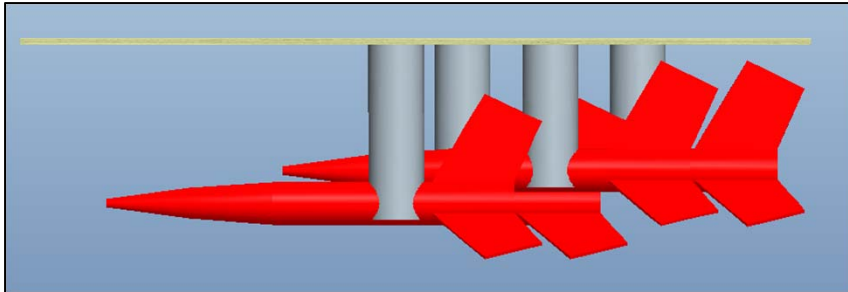




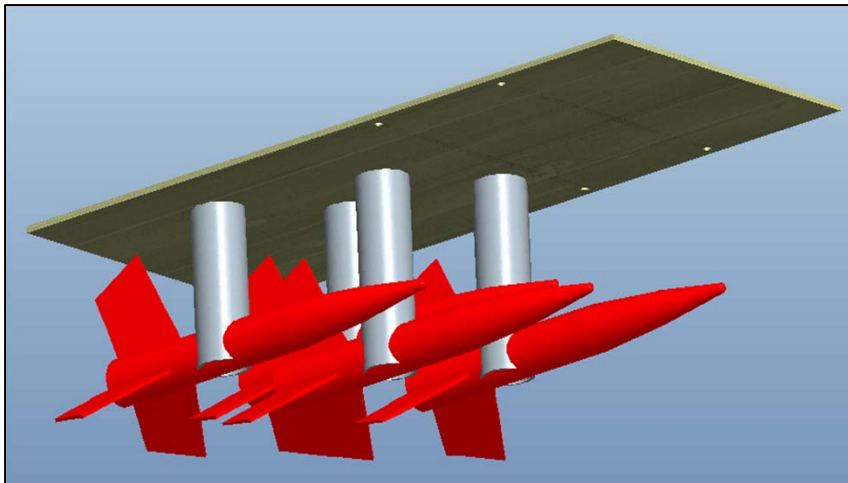
Internal Store Assembly



Profile

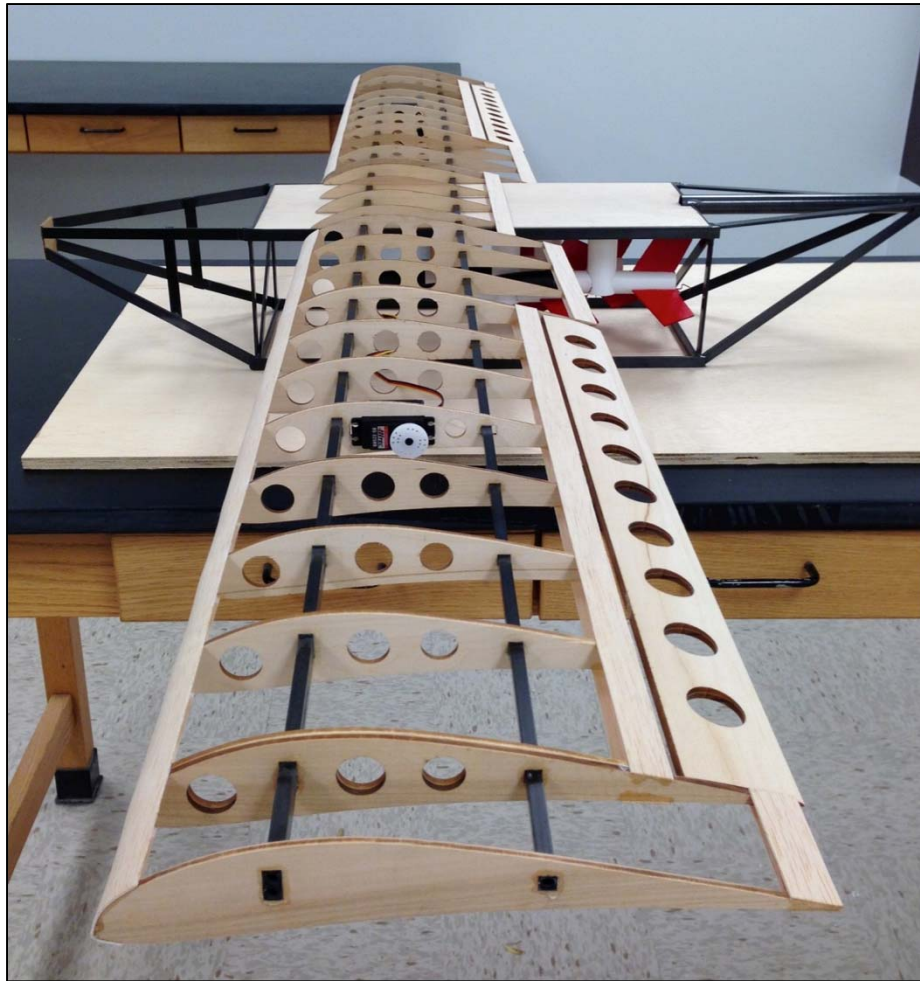


Isometric

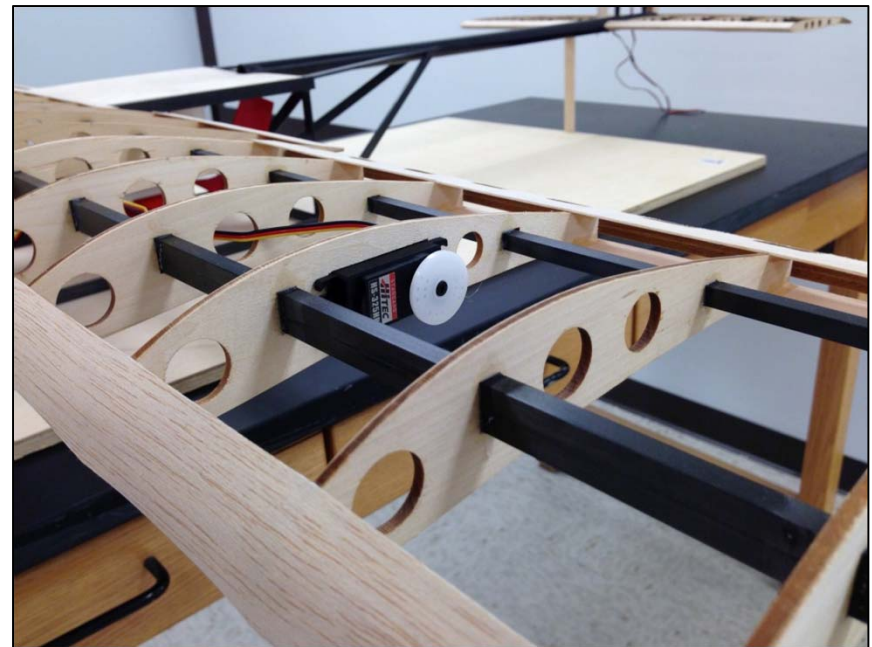




Main Wing

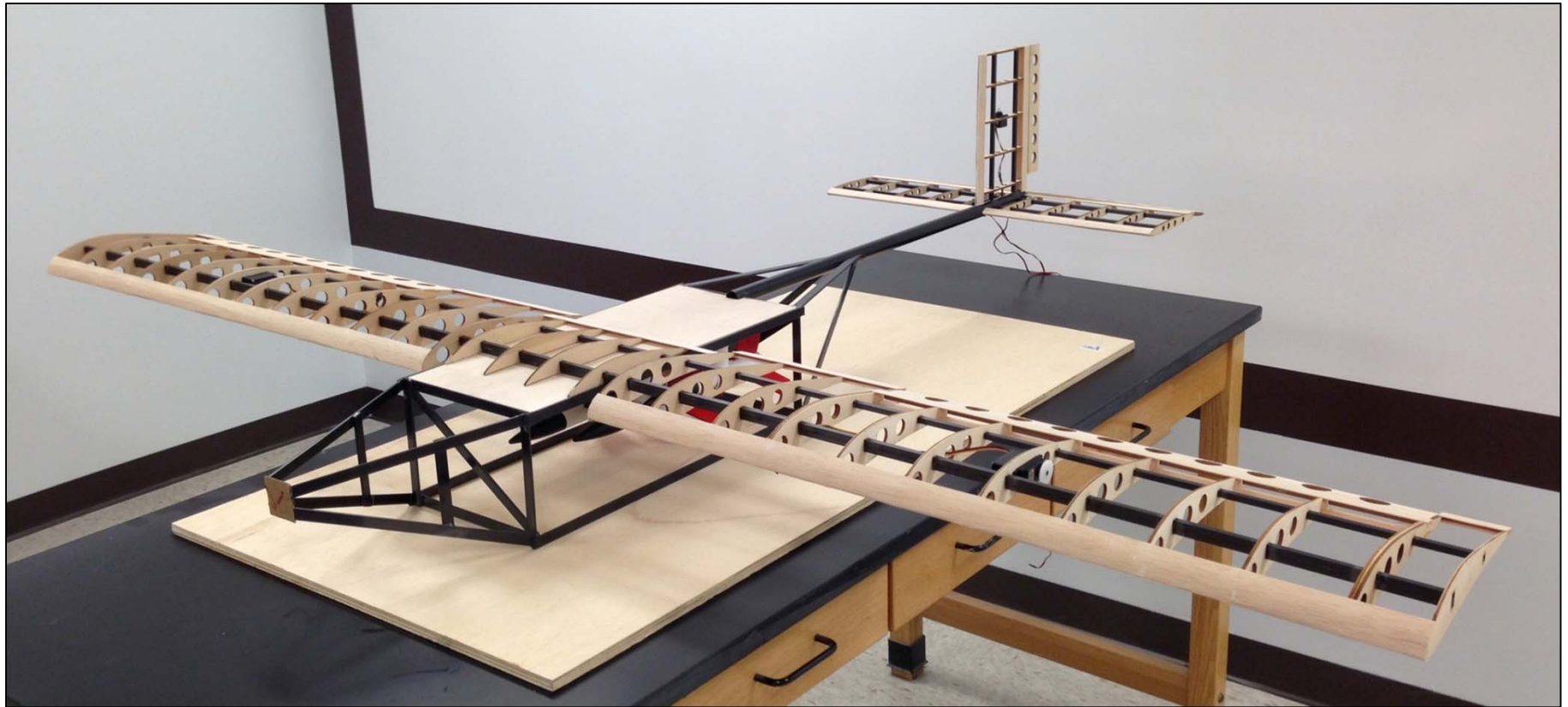


- Something something
- Something else
- And some other shit





Current Aircraft Progress





Propulsion Circuit “Re-examination”



Initial Empty Weight Estimate TOO LOW

- During initial design process we estimated our aircraft to have an empty weight of roughly 3 lbs.
- Through material testing we determined our fuselage needed to be constructed of stronger material
- This required our “ready to fly” weight to increase by 3 lbs.
- Yielding a total all up weight of 9 lbs. including internal and external rockets

New Propulsion Circuit

- More weight requires more thrust
- More thrust requires higher voltage



Propulsion Circuit Limitations



Competition Restrictions:

- Propulsion circuit battery pack must weigh ≤ 1.5 lbs
- Current draw limited to 20 Amps by inline fuse

What This Tells Us:

- Power = Volts x Amps
- Since we are limited to 20 A we will need the maximum voltage possible
- Optimal cell type:
 - Size – 2/3 A**
 - Volt – 1.2 V**
 - Capacity – 1600 mAh**
- Pack will yield 28.8 V at just under 1.5 lbs.
- Power = 575 Watts



Motor / Propeller Selection



Velocity and Thrust Requirements

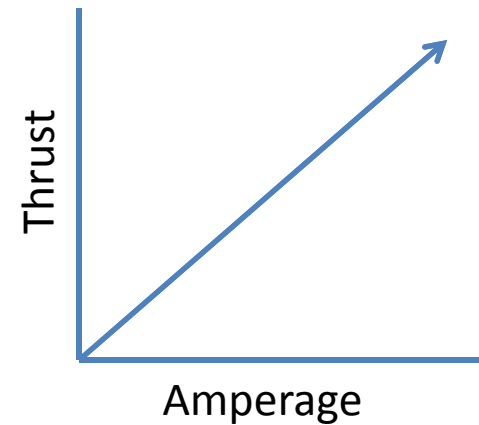
- Wing Loading = 25.73 oz/ft²
- Stall Speed = 25.36 mph
- Max Speed ≈ 65 mph
- Thrust > ½ Total Weight (72 ounces)

Effect of Thrust on Current Draw

- Thrust is generated by the pitch of propeller blade
- Larger pitch = Rise in thrust

Solution

- 2.5:1 Gear box
- Provides mechanical advantage to turn prop w/out added torque on motor





Updated Propulsion System

E-Flite Power 15 Brushless



APC Prop: Dia-13in Pitch-8in



Elite 1500 mAh
1.2V x 22 Cells
26.4 Volts



Performance

Thrust : 76 oz.

Max Velocity : 60 mph

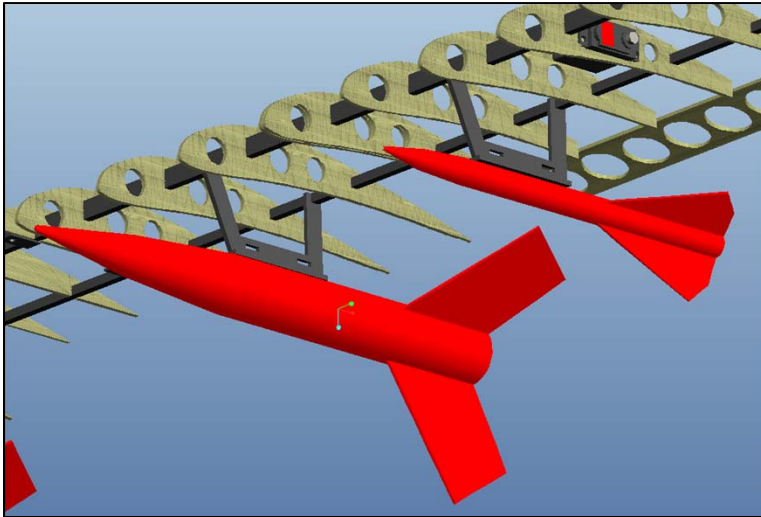
Full Throttle Duration : 5+ min



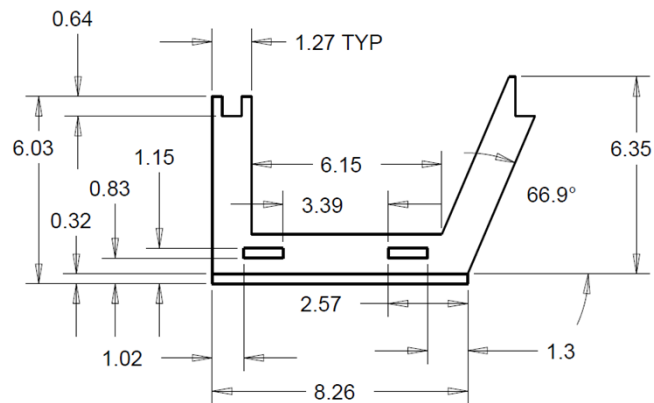
Future Work



Complete External Store Attachments



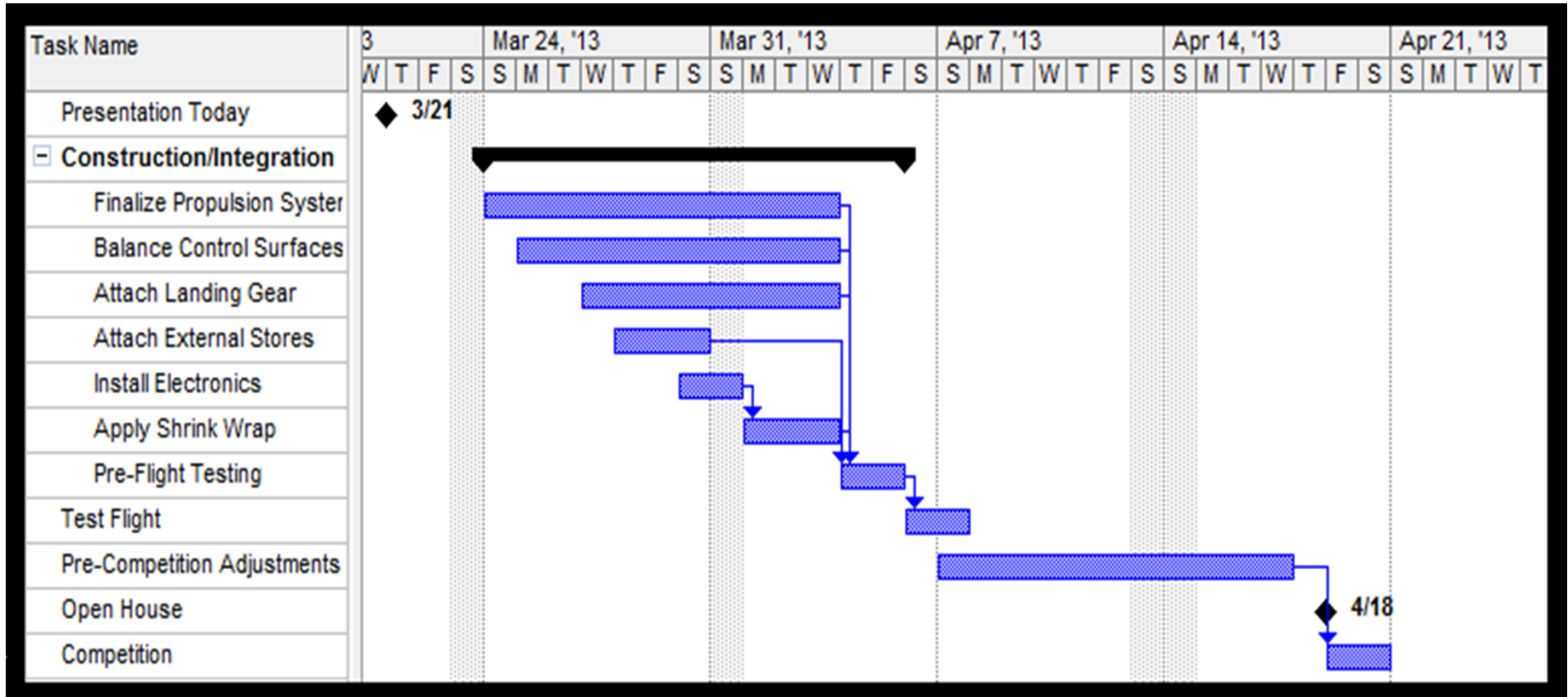
- Integrate motor and gear system with fuselage
- Install Electronics
 - Receiver
 - Speed Controller
- Attach Landing gear
- Cover plane with Shrink wrap
- Test Fly



Dimensions in cm



Schedule





Questions

