Suborbital Spaceflight

A student team's plan to fly a rocket to space

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EAGLE SPACE FLIGHT TEAM

Abstract

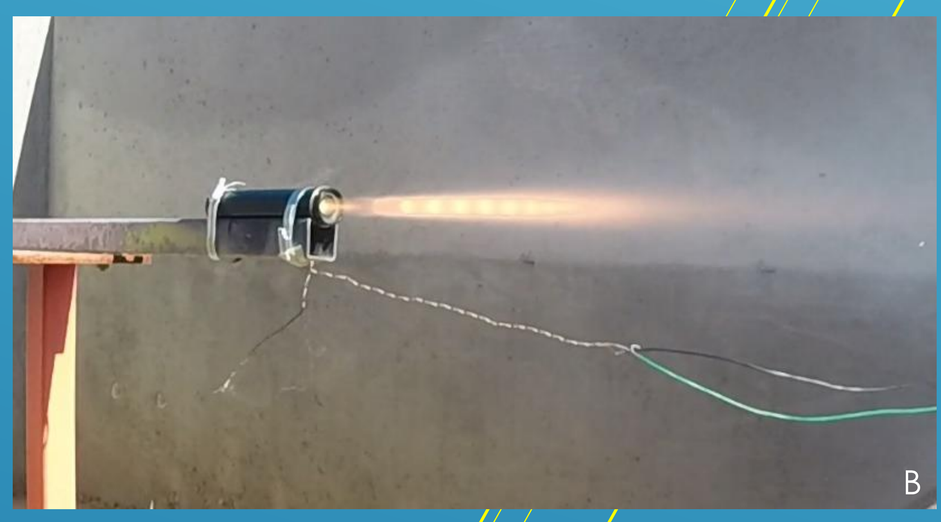
The Eagle Space Flight Team was created with the goal of becoming the first undergraduate team to design, build, and launch a rocket capable of suborbital spaceflight. In order to achieve this goal, the team will have to design a rocket capable of atmospheric flight at speeds over Mach 5 and launch it on one of the largest amateur rocket motors ever made. Over the next three years, the team will progress towards accomplishing this feat through a series of incremental test flights. Before the space flight, the team will build three sub-scale rockets designed to reach altitudes of 30,000', 50,000', and 100,000', respectively. These rockets will allow the team to develop, test, and refine the technologies needed for the final flight to over 350,000'. We believe that this progressive approach will lead the team to success.

3-Year Plan

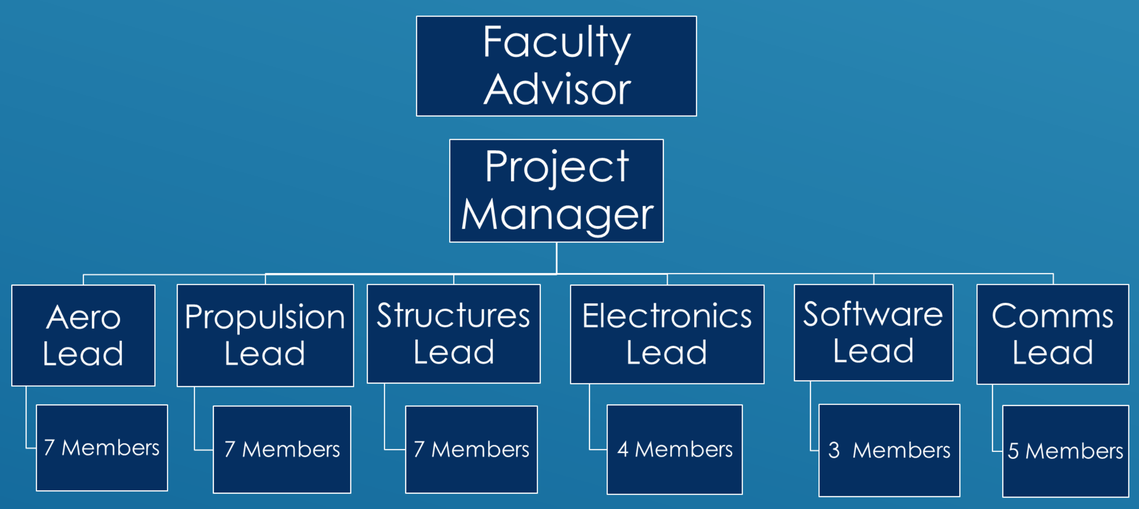
Semester	Milestones Reached
Fall 2014	- Design and construct 3" diameter rocket capable of reaching 30,000' and surpassing Mach 1.5
Spring 2015	- Perform a test flight of the 3" rocket using a commercially-made motor - Perform a second test flight of the 3" rocket using a motor made by the team - Design and construct 4" diameter rocket capable of reaching 50,000' and surpassing Mach 2 - Perform a test flight of the 4" rocket using a motor made by the team
Fall 2015	- Design and begin construction of a 6" diameter rocket capable of reaching 100,000' and surpassing Mach 3 - Acquire FAA Class 3 Waiver for launch site in Black Rock Desert
Spring 2016	- Complete construction of 6" rocket - Perform a test flight of the 6" rocket using a motor made by the team
Fall 2016	- Design and begin construction of 10" diameter rocket capable of reaching over 100km and surpassing Mach 5
Spring 2017	- Complete construction of 10" rocket - Launch 10" rocket on a suborbital space flight

Propellant Formula

Ammonium Perchlorate (200μ)	72.00%
Aluminum (20μ)	7.00%
Oxamide	3.00%
R45 HTPB	14.08%
IDP	1.80%
E744	2.11%
Silicone Oil	0.01%



Team Structure



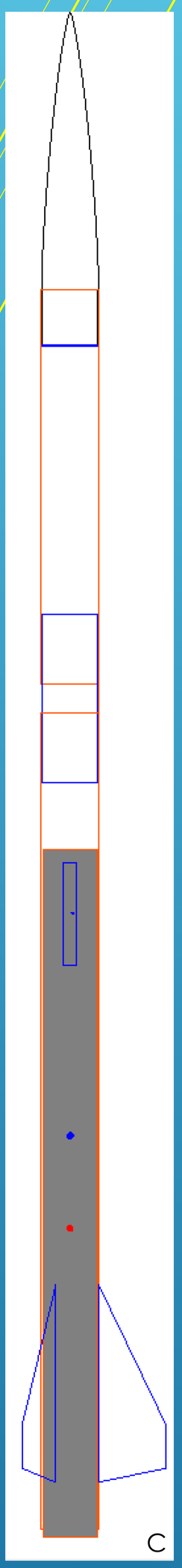
Budget

Year	Item	Price
1	30,000 ft. Rocket	
	Vehicle	$ 600.00
	Electronics	$ 800.00
	Motor Hardware	$ 500.00
	Propulsion Chemicals	$ 200.00
	50,000 ft. Rocket	
	Vehicle	$ 400.00
	Electronics	$ 500.00
	Motor Hardware	$ 600.00
	Propulsion Chemicals	$ 400.00
2	100,000 ft. Rocket	
	Vehicle	$ 1,200.00
	Electronics	$ 700.00
	Motor Hardware	$ 1,200.00
	Propulsion Chemicals	$ 1,800.00
3	400,000 ft. Rocket	
	Vehicle	$ 2,000.00
	Electronics	$ 1,000.00
	Motor Hardware	$ 6,000.00
	Propulsion Chemicals	$ 9,000.00
Grand Total		$ 26,900.00

Left (A): A member of the Eagle Space Flight Team measures out powdered aluminum during a propellant mixing session.

Above Center (B): The team's first sub-scale static motor test, delivering approximately 200Ns of impulse and 30lbs of thrust.

Above Right (C): A preliminary design for the airframe of the team's first sub-scale flight vehicle



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