

# Penn State Preliminary Design Review Project Titian



November, 18 2014

# Overview

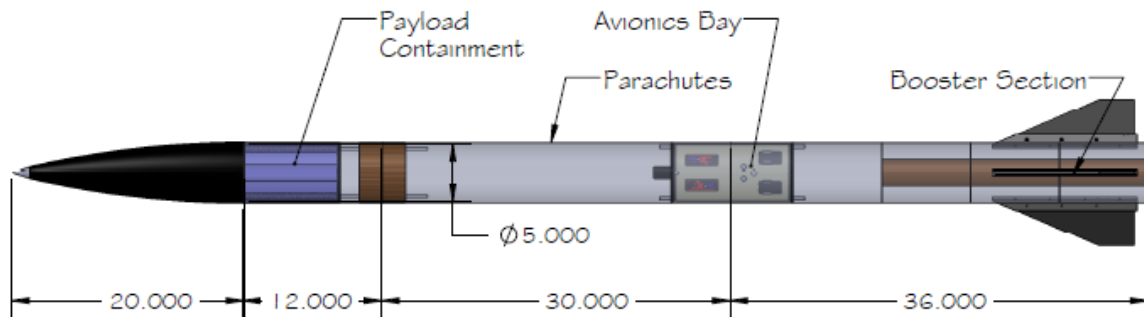
- Team introduction
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- Structures overview
  - Rocket design
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- Avionics and Recovery
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  - Payload Design (Theia)
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  - Lifting system (Atlas)
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- Conclusion



# Team Introduction

- Exec Committee
  - Heather Dawe (Project Manager)
  - Kelsey Miller (Treasurer)
  - Amy Maffi (Educational Engagement)
- Structures Subsystem
  - Alex Balcher
  - Luke Georges
- Avionics and Recovery Subsystem
  - Dylan Kempton
  - Scott Cowen
- Propulsion Subsystem
  - Connor Wilson
  - Max Winn
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# General Overview

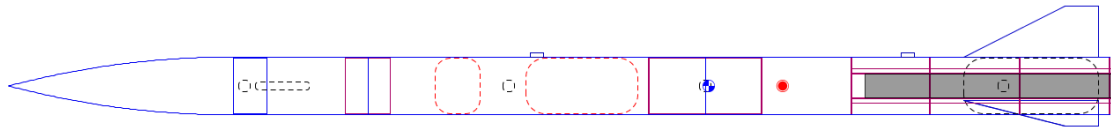


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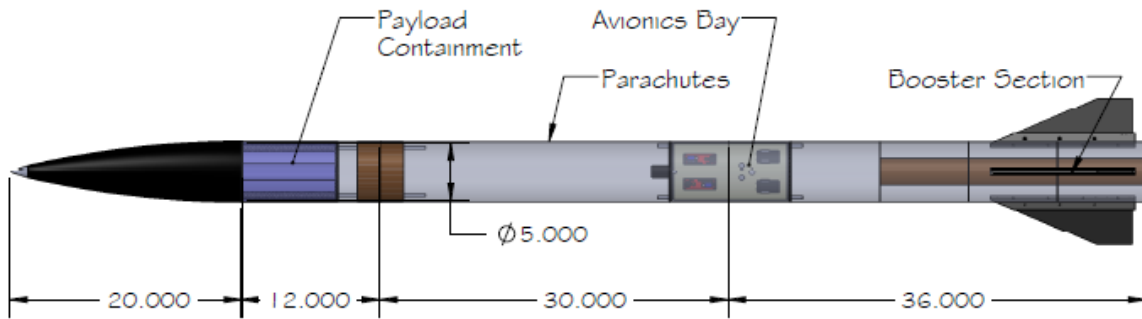
# Structures-Rocket Design

Rocket  
Length 251 cm, max. diameter 13.1 cm  
Mass with motors 9567 g

Stability: 1.28 cal  
CG: 158 cm  
CP: 175 cm  
at M=0.30

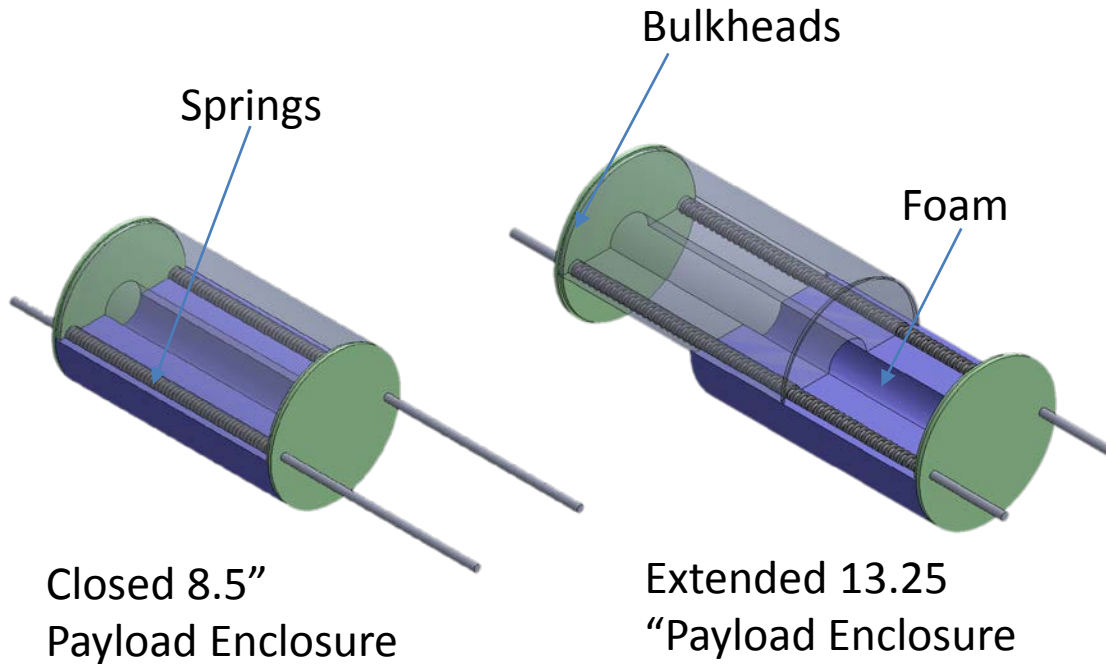


Apogee: 857 m  
Max. velocity: 134 m/s (Mach 0.39)  
Max. acceleration: 34.6 m/s<sup>2</sup>



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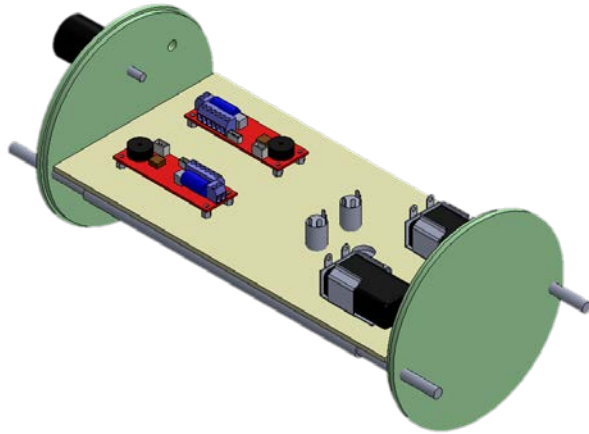
# Structures-Payload Enclosure



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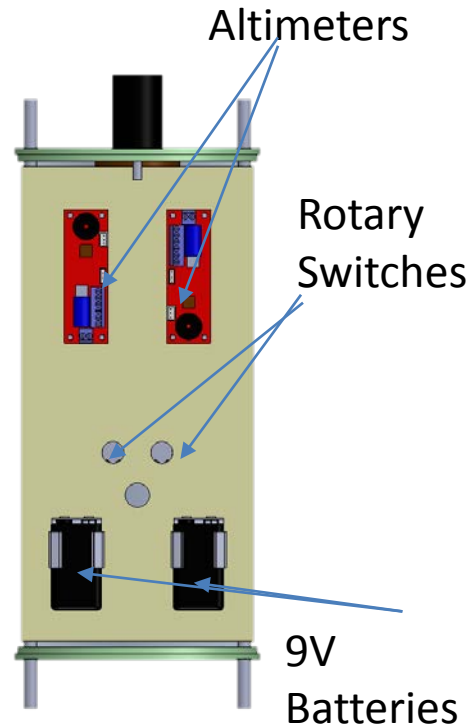


# Avionics and Recovery



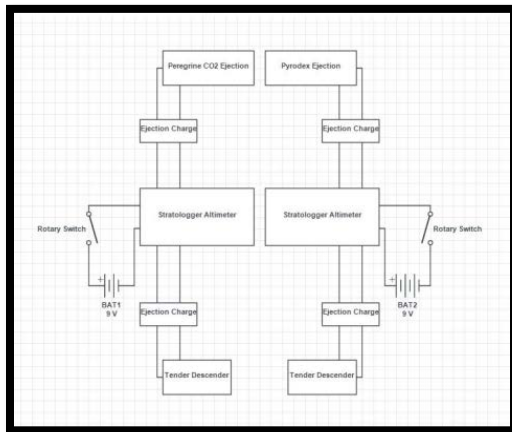
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# Avionics and Recovery- Parachute System Setup



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Wiring Diagram





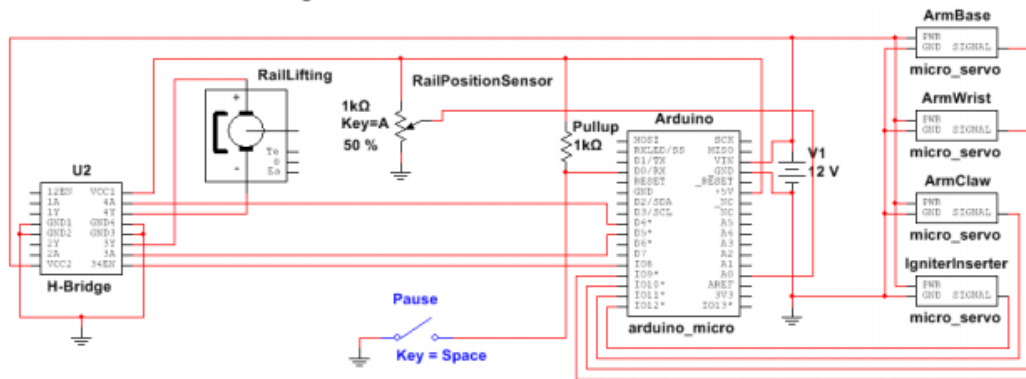
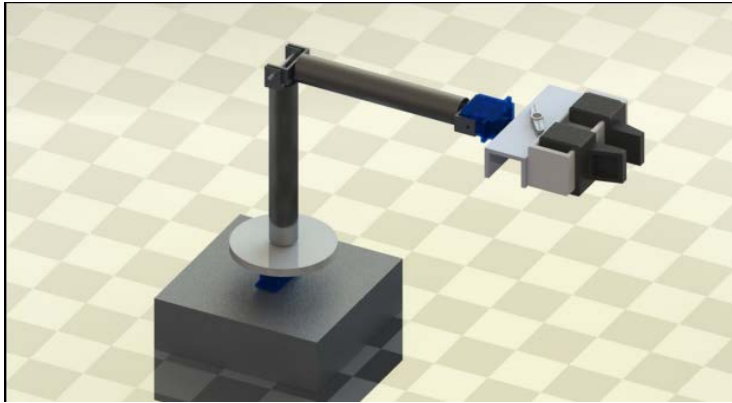
# Avionics and Recovery-Parachute Selection



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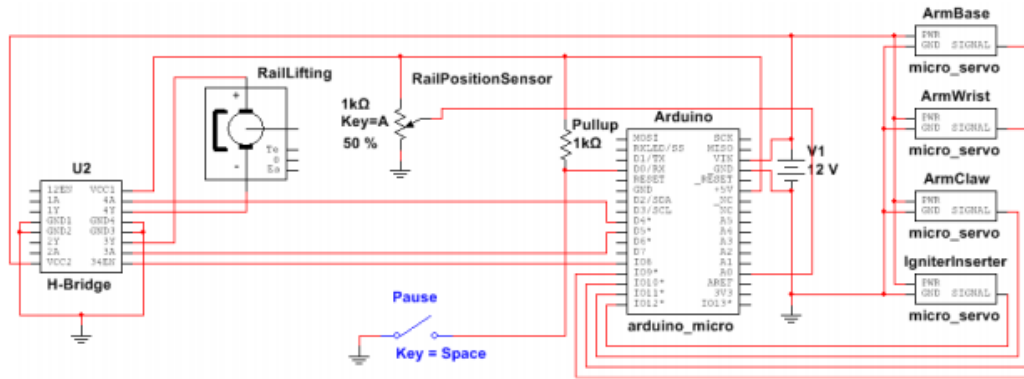
Parachute	Size
Main	24" Giant Leap
Drogue	72" Fruity Chutes

# Payload



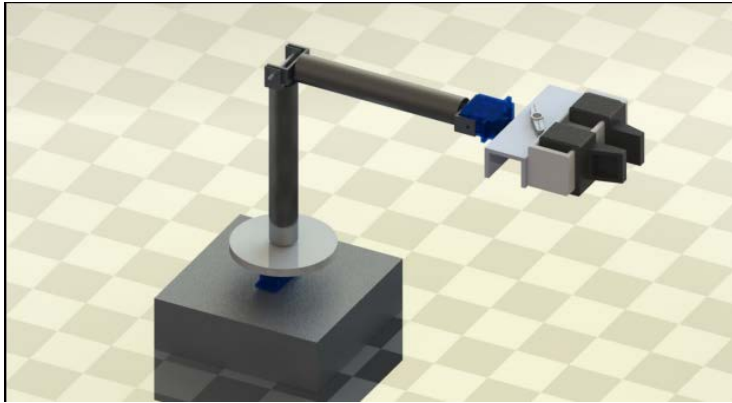
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# Payload-AGSE



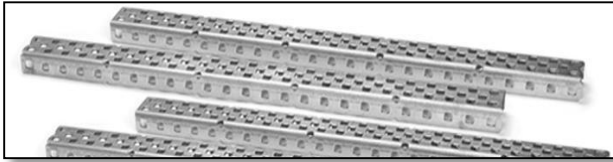
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# Payload-Payload Design



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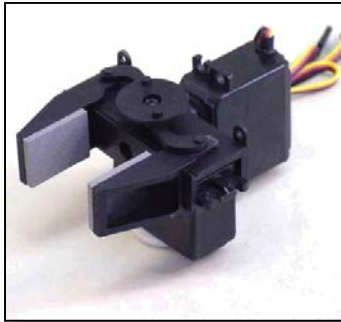
# Payload- Payload Materials



Limbs – Aluminum Square Channel Rods



Mounting Brackets – Aluminum C/L Brackets



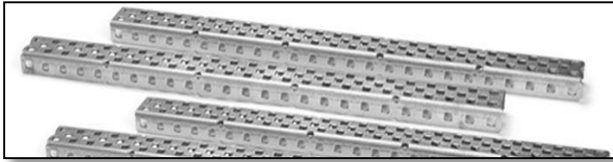
Gripper – Lynxmotion Little Gripper



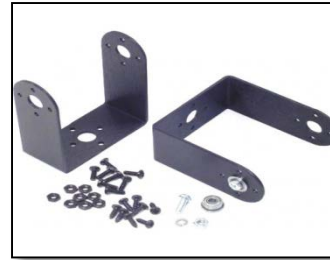
Base – Thick Aluminum Disks

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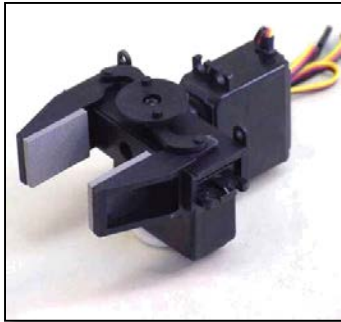
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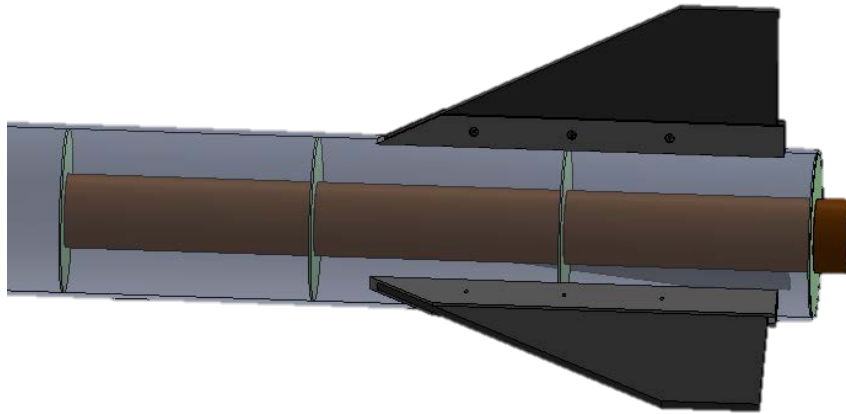
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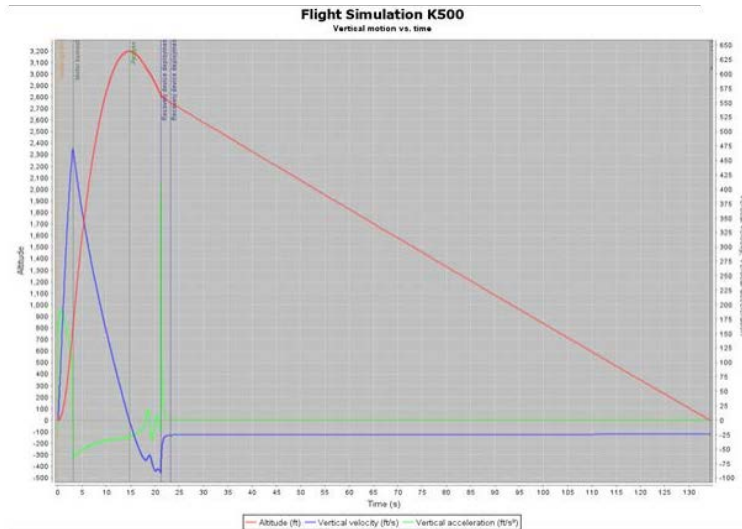
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# Propulsion



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# Propulsion-Motor Selection

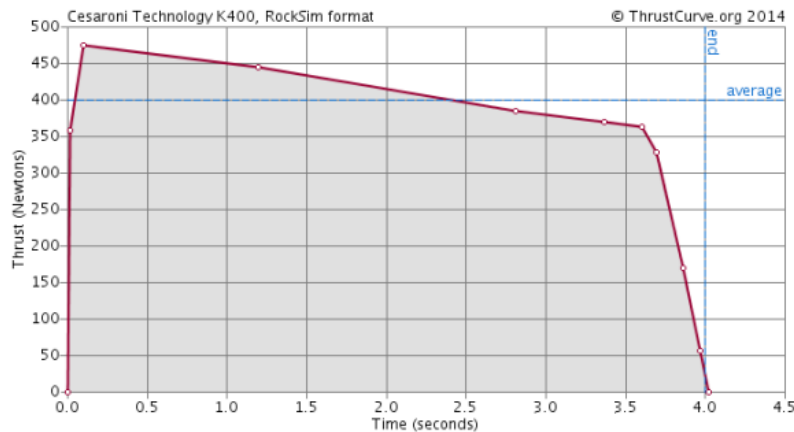
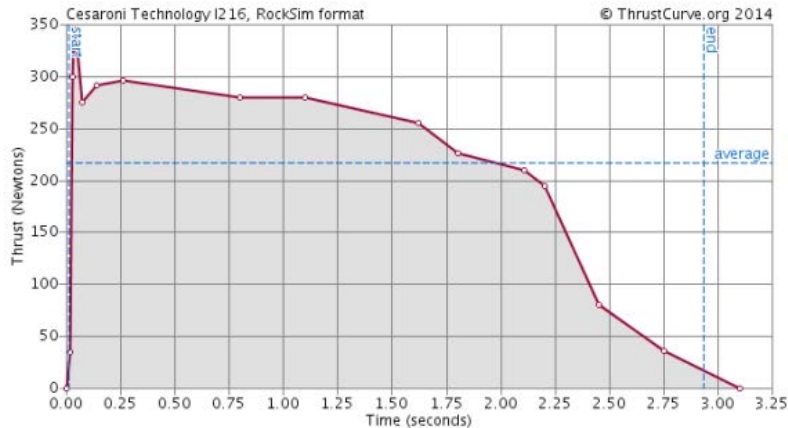


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Motor	Manufacturer	Apogee (ft.)	Points Deducted	Exit Rail Velocity (ft/s)	Max Thrust (N)	Maximum Acceleration (ft/s <sup>2</sup> )
<b>Full Scale</b>						
K445-17	Cesaroni	3421	421	64.7	665	213
K500-RL-8	Cesaroni	3084	84	60.6	595	190
K400-GR-14	Cesaroni	3185	185	53.2	475	142
<b>Subscale</b>						
I216	Cesaroni	3203	203	67.9	345	261



# Propulsion-Motor Testing



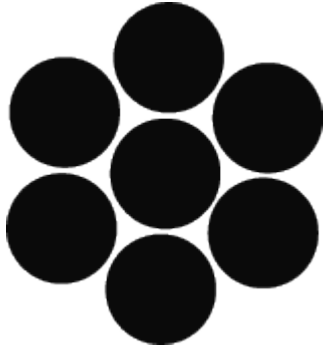
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# Propulsion-Lifting System Atlas (Overview)



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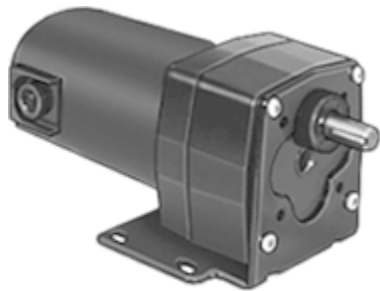
# Propulsion-Lifting System Atlas (Materials)



1 x 7 Galvanized Steel Cable



Vex 2-Wire Motor 393



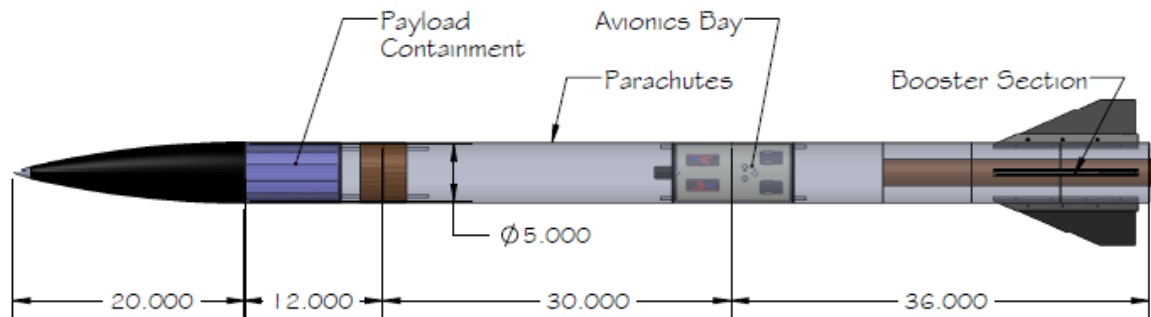
McMaster Parallel Shaft DC Gearmotor



12ft aluminum rail

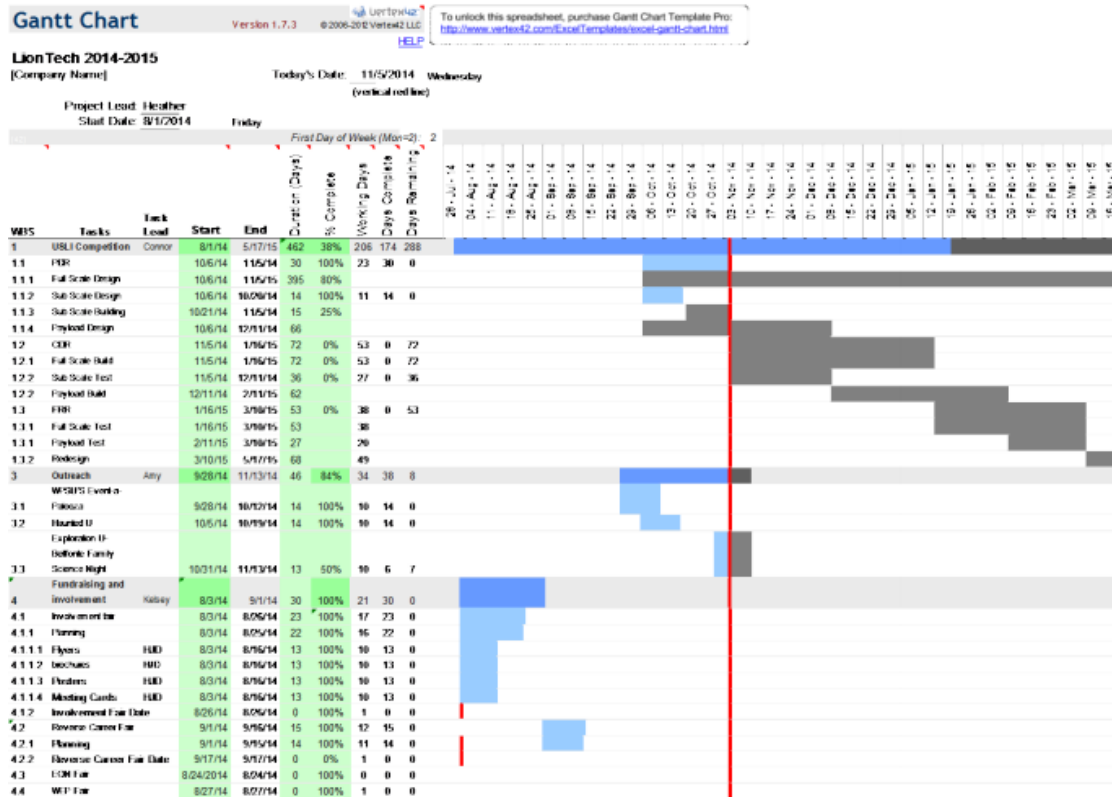
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# Mission Overview-Integration



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# Mission Overview-Time Line



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# Budget Overview-Costing

Expected Costs, 2014-2015	
Full Scale	\$ 4,000.00
Subscale	\$ 1,700.00
Testing	\$ 1,000.00
Ground Support Equipment	\$ 2,000.00
Travel	\$ 8,000.00
Outreach	\$ 300.00
<b>TOTAL:</b>	<b>\$ 17,000.00</b>

Predicted Cost of Full Scale by Subsystem	
Subsystem	Amount
Avionics & Recovery	\$1346.84
Payload	\$240.25
Propulsion	\$1465.77
Structures & Aerodynamics	\$753.94
<b>TOTAL</b>	<b>\$3806.80</b>

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# Budget Overview-Funding

Expected Income, 2014-2015	
Aerospace Engineering Department	\$5,000.00
Mechanical Engineering Department*	\$500.00
Space Grant	\$6,000.00
UPAC	\$6,000.00
<b>TOTAL:</b>	<b>\$17,500.00</b>

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# Educational Engagement

Event	Date
WPSU Catapalooza	October 12, 2014
Penn State Science U - Haunted Lab Tour	October 19, 2014
Science U - Bellefonte Family Science Night	November 13, 2014
Science U – STEM Career Day for Women	January 31, 2015
Science U - State College Science Night	March 25, 2015
Park Forest Middle School	TBA
Science U – Day Camps and Events	TBA (Multi-week)
Discovery Space Science Workshops and Events	TBA (Multi-week)

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# Conclusion- Mission Statement

- “To demonstrate and gain knowledge in rocketry practice while implementing innovative scientific research and conducting exceptional community outreach. To continually evolve in both knowledge and creativity in all aspects of the USLI competition.”
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