Rocketry Internal Design Review

Olin Rocketry, Andromeda Phase A, 2019

Structures

Structures Phase A Plan

Develop and test airframe fabrication techniques by creating carbon replacement parts for the Phoenix II rocket platform

Goals:

1) Reduce weight vs Blue Tube
2) Increase or maintain stiffness
3) Make it pretty and professional
4) Create a scalable, repeatable, and consistent process for airframe construction
5) Test different wall thicknesses and layer counts
6) Further research how to scale process and what equipment needed for larger rockets

Composites Crash Course

Two parts, **carbon fiber fabric** and **epoxy resin**

Tube Fabrication Process:

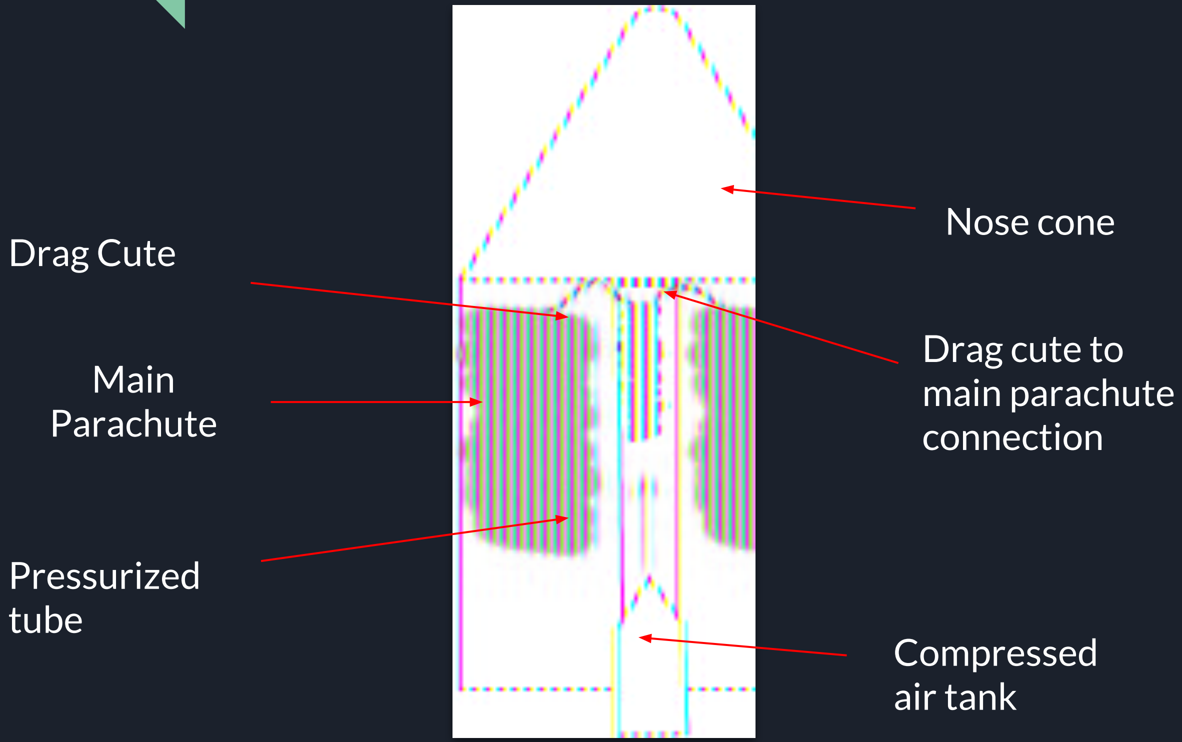
1) Mandrel preparation (OD of mandrel becomes ID of carbon tube)
2) Impregnating carbon fabric with resin
3) Pre-Impregnated Carbon Layup around mandrel
4) Curing (possible vacuum bagging)
5) Mandrel removal and tube cleanup

Semester 1 Fabrication Plan

1) Find/create mandrel with OD equal to ID of Blue Tube from Phoenix II (possibly a turned delrin cylinder)
2) Use carbon fabric cut offs from HPV team to begin laying up carbon tubes the correct size for replacing Phoenix II Blue Tube airframe sections
3) Test the tubes for stiffness and weight, and make adjustments to the fabrication process to improve strength to weight ratio
4) Fabricate new updated tubes for spring 2019 test flights of the Phoenix II
5) If ahead of schedule, look into creating carbon fiber fairings and/or nose cone to replace existing PLA hardware
6) Prep carbon Phoenix II for launch ahead of launch date (April 3/10, 2019)

Recovery

Skeptic Braden



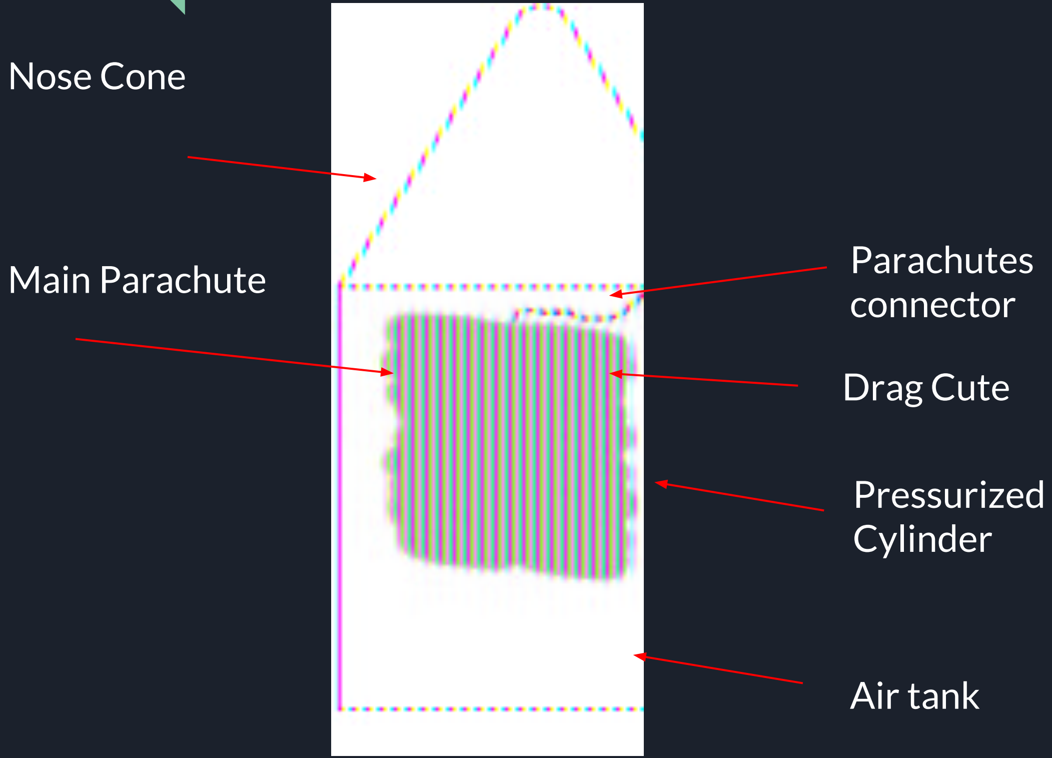
Pros:

1. Small area to pressurize
2. Drag cute pulls main parachute
3. Drang cute and main parachute separated
4. Can be implemented with two parachutes for redundancy

Cons:

1. Main parachute might get caught on center tube
2. Hard to mount the pressurized tube in the center

Sad Braden



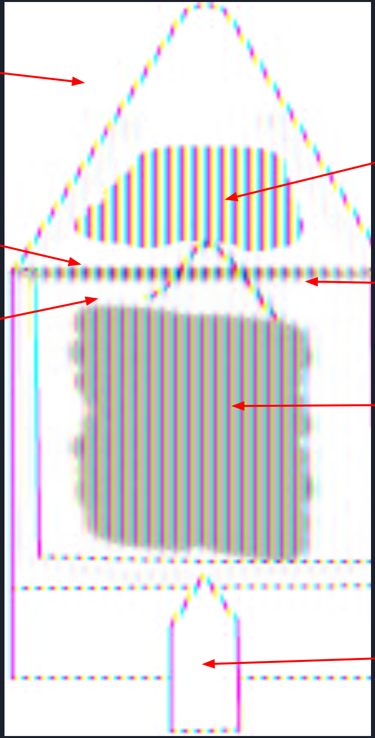
Pros:

1. Nose cone might get out of the way easier
2. Small area to pressurize
3. Drag cute pulls main parachute
4. Drang cute and main parachute separated

Cons:

1. Nose cone might stuck in ejection
2. Weight of air tank has to be offseted

Elon Braden



Pros:

1. Small area to pressurize
2. Drag cute pulls main parachute
3. Eject nose cone and free drag cute

Cons:

1. Weight of air tank has to be offseted
2. Will have to figure out how to mount the plate between the the nose cone and the body.

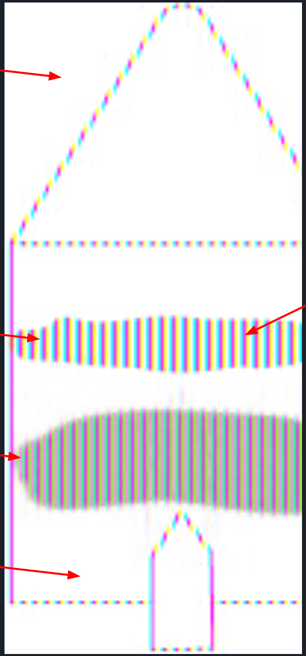
Colorful Braden

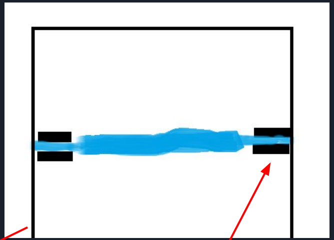
Nose Cone

Drag Cute

Main Parachute

Air Tank





Drang Cute holding mechanism

Pros:

1. Disk will inflate the drag cute before depressurization
2. Drag cute pulls main parachute
3. Simple system

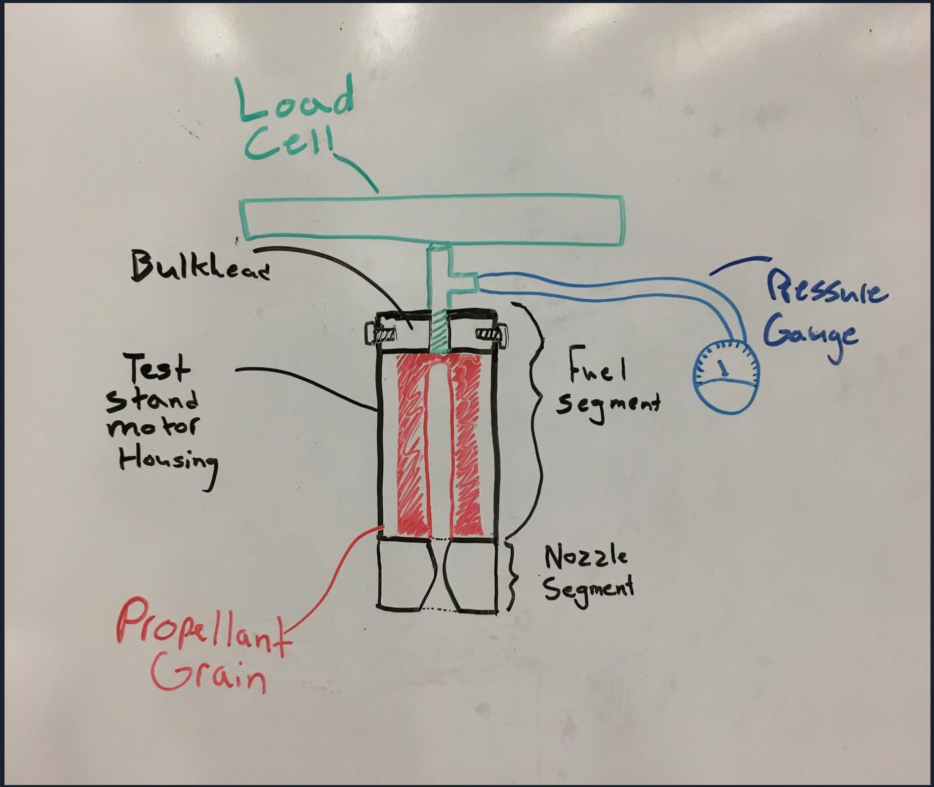
Cons:

1. Drag cute and parachute might get tangled
2. Large area to pressurize

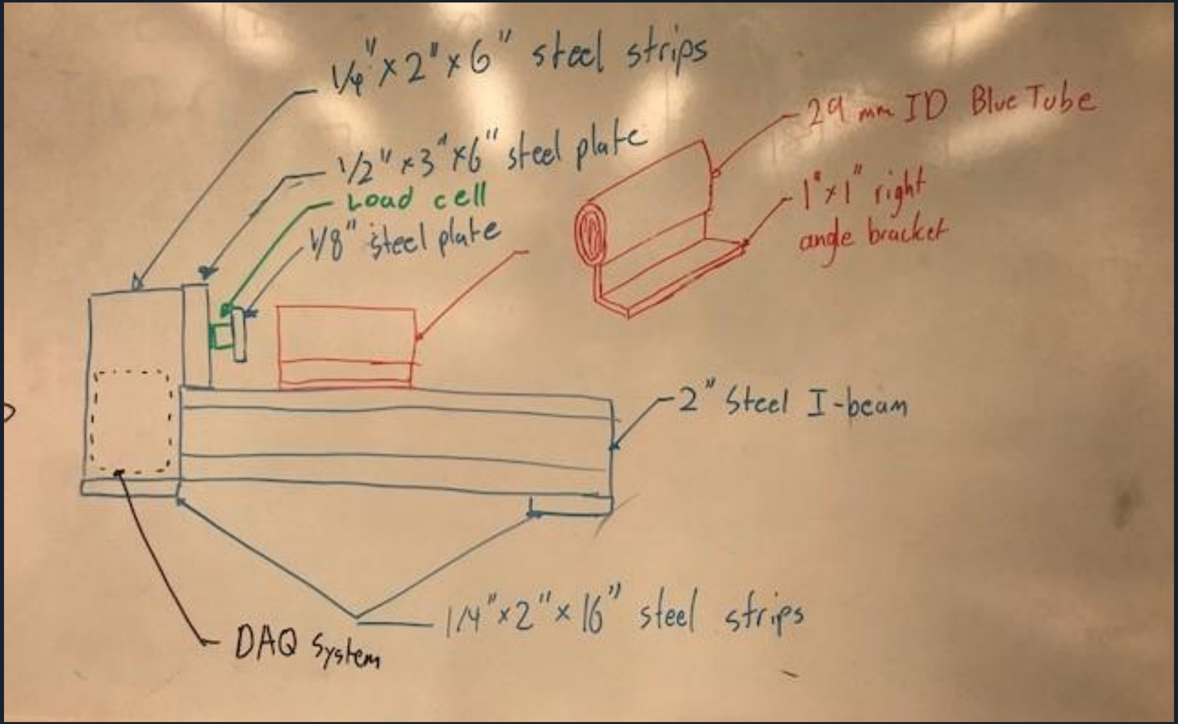
Engine (Mechanical)

[Phobos-??T]

- Impulse TBD, requires more data on fuel
- Housing Material: Aluminum
- Nozzle Material: Graphite
- Housing split into two segments (nozzle and fuel) for better seal with nozzle.
- Attaches to bulkhead and pipe fitting via bolts at top of housing



Perseus v1.0

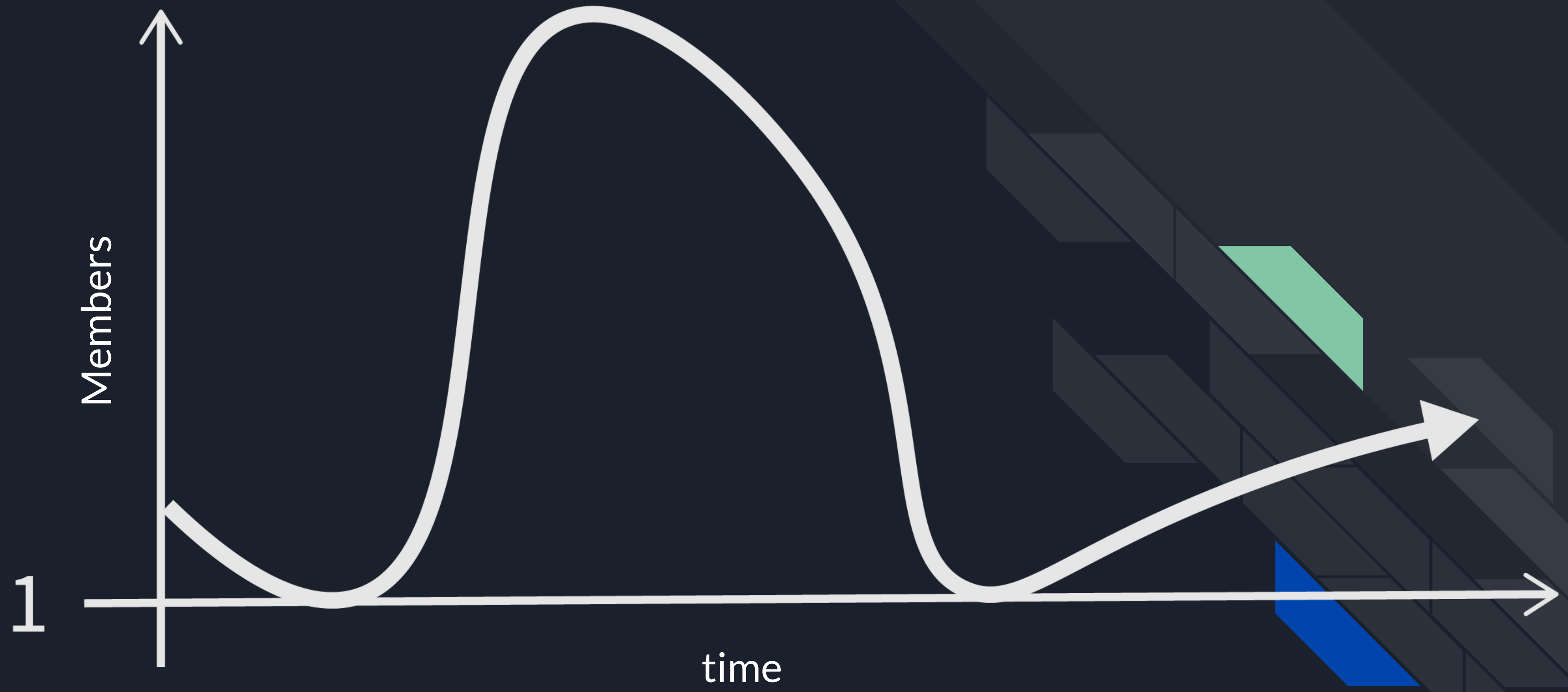


Adapted from *Experimental Composite Propellant*

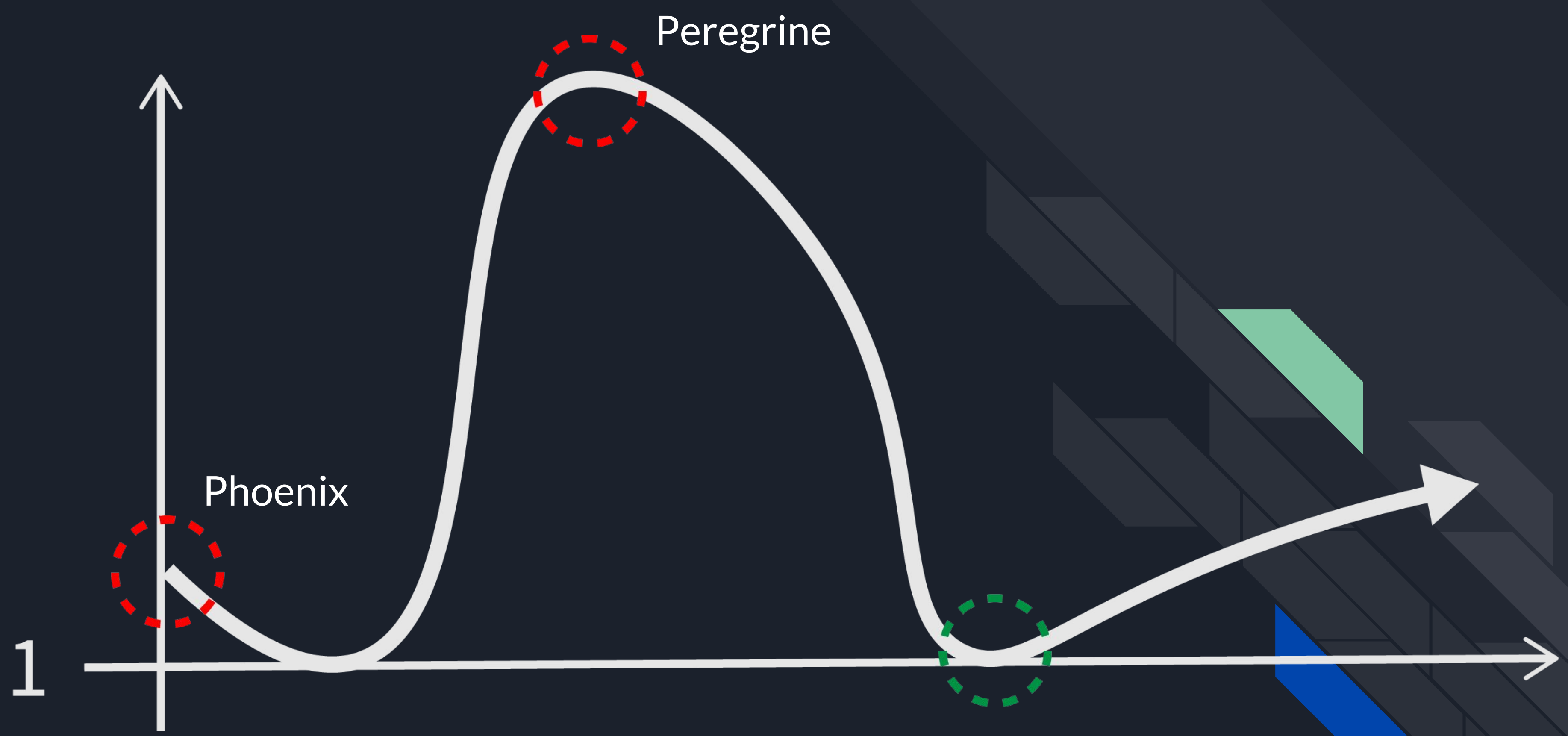
- Uses steel plates welded to an I-Beam
- Two steel strips on either side for stabilization
  - Weighed down by weights
- Load cell attached to plate
- Motor retained by blue tube on right angle bracket
  - Don’t have solution (yet) to retain axially

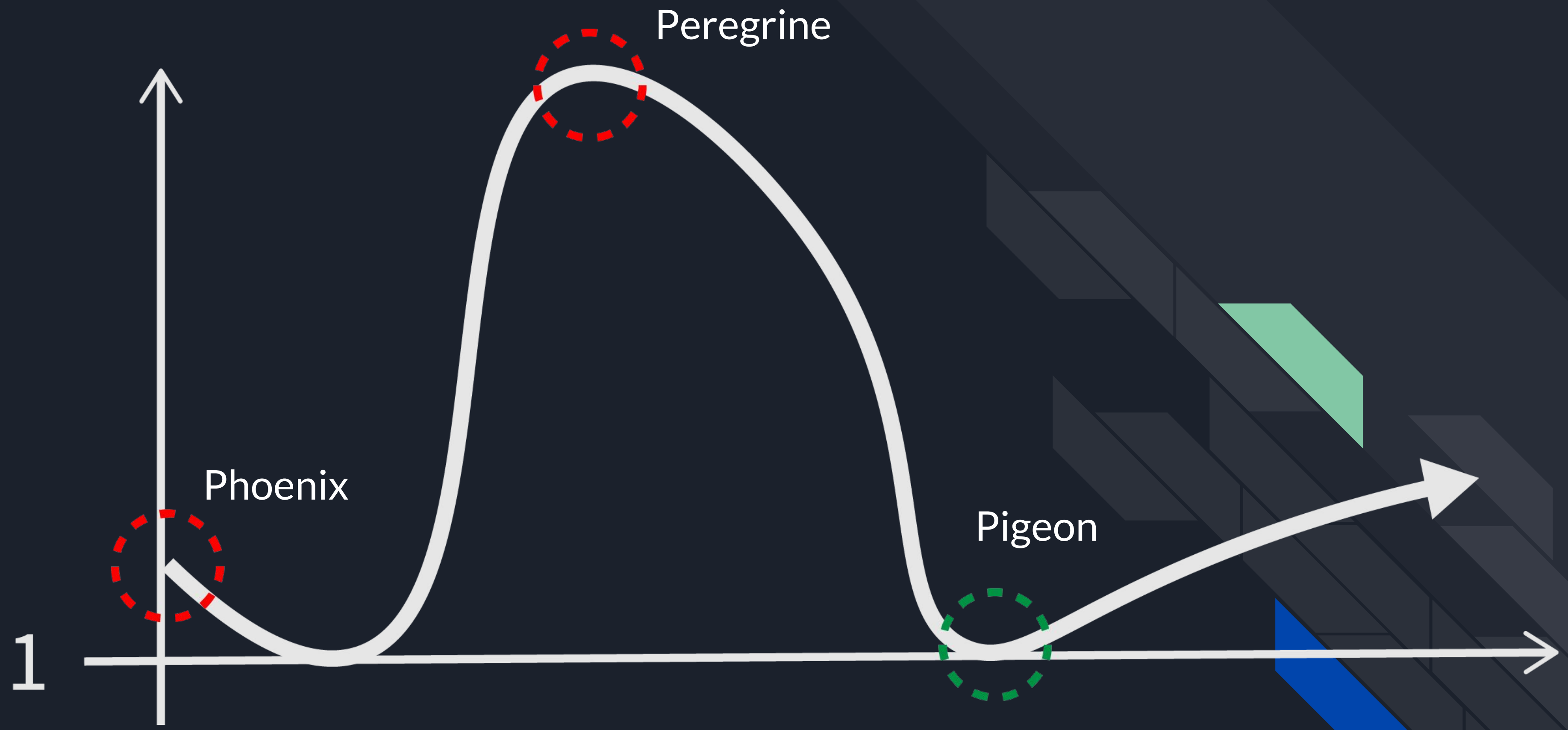
Engine (Chemical)

Avionics



Members
1
time


Peregrine
Phoenix
1


Peregrine
Phoenix
Pigeon
1

High-Level Design Changes

- Optimize projects for a small team
- Plan for members’ weak points
- Establish long term progression

Pigeon

- Microprocessor
  - Atmega328P
- Programming Environment
  - Arduino IDE
- Sensors
  - ADXL345
- microSD card

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Cost to Build: $0

Goals for the Semester

- Predict altitude from acceleration data
- Store data onto a microSD card
- Purchase and use a COTS flight computer

Progress

- ~ 1 week behind schedule on Pigeon
  - Aiming at 2/15 completion
- Expanded team to 3 members (hi Alex)
- Specc'd a COTS flight computer
  - StratologgerCF ~ $70