# Modular Autonomous Launch Platform For A Martian Ascent Vehicle Analogue Mission

**Preliminary Design Review**

**2015 NASA Student Launch**


**ARIZONA STATE UNIVERSITY**

# VEHICLE DIMENSIONS, MATERIALS, AND JUSTIFICATIONS

## Dimensions:

- 98 mm Diameter Airframe
- 107” length
- 15.9 lb mass
- 13.4 lbs w/o motor

## Materials:

- Shockwave Rocketry Fiberglass Nosecone
- MAV Payload
- Blue Tube 2.0
- Birch Plywood Centering & Fins

# STATIC STABILITY MARGIN

- **A dimensionless number computed by taking the difference in the center of gravity and center of pressure of the rocket divided by the body tube diameter**
- **Stability Margin: 3.17**
- **CP: 67.342**
- **CG: 54.595**
- **Borderline over stable.**

# PLAN FOR VEHICLE SAFETY VERIFICATION AND TESTING

- **The Safety Officer, in coordination with the Project Manager and the subsystem team leads, will develop safety checklists for use during launch preparations.**
- **The Safety Officer, in coordination with the team's mentor, will organize ground tests requiring handling of prohibited materials.**
- **The Safety Officer will be responsible for ensuring all flights are completed in accordance with NAR and FAA regulations.**
- **The Safety Officer will be responsible for verifying the completion of all safety checklist items prior to launches.**

# BASELINE MOTOR SELECTION AND JUSTIFICATION

- **J800T-16**
- **Ammonium Perchlorate Composite Propellant**
- **OpenRocket simulations demonstrate that the motor best fits the mission requirements**

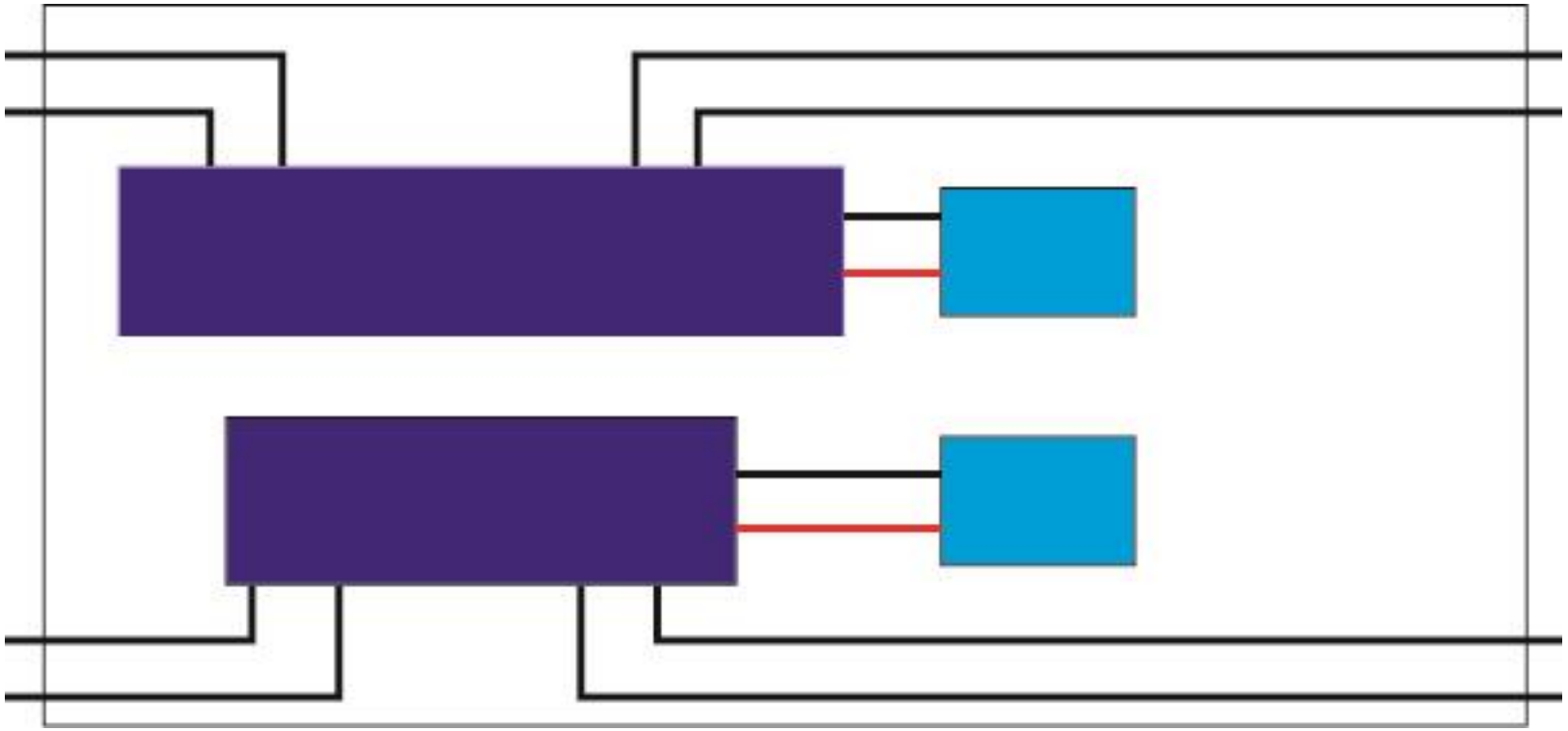
# THRUST-TO-WEIGHT RATIO AND RAIL EXIT VELOCITY

- **Thrust to weight ratio: 11.3**
- **Rail exit velocity: 102 ft/s**

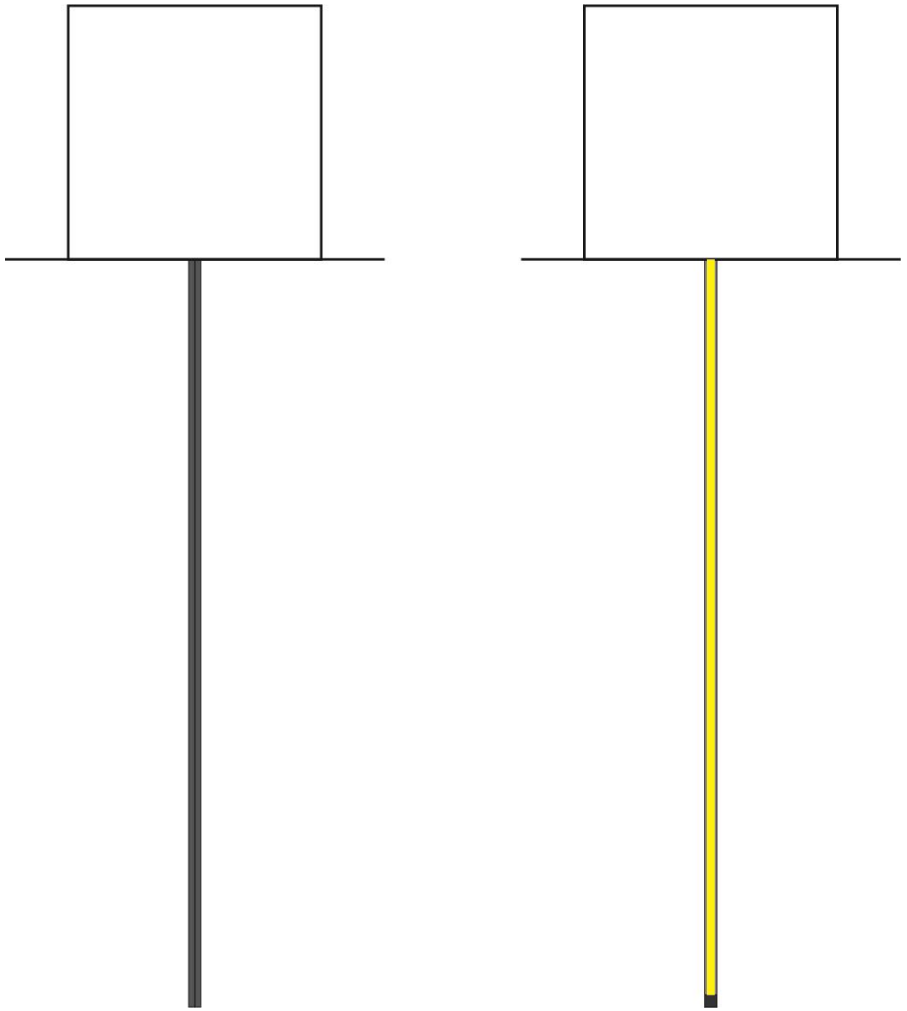
# LAUNCH VEHICLE VERIFICATION AND TEST PLAN OVERVIEW

- **OpenRocket simulations**
  - Ensure simulations lead to a successful recovery
- **Test electronics before launching**
- **Ensure proper fuel is being used**
- **Multiple test flights**
  - Test system functions
  - Test motor

# ELECTRONICS PAYLOAD BAY SCHEMATIC



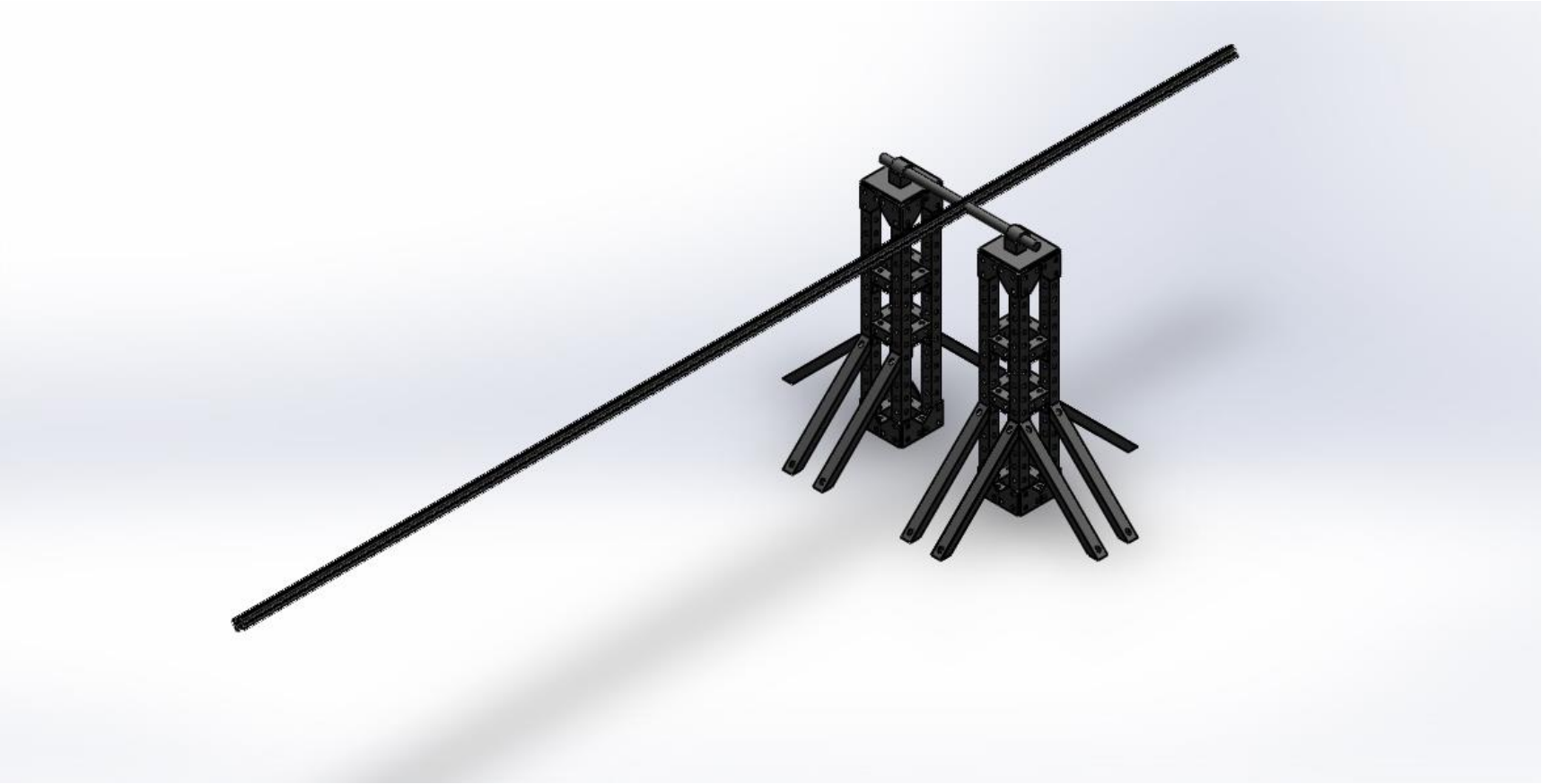
# IGNITER COMPONENT



# ARM

# TOWER WITH STRUTS

# FINAL ASSEMBLY



# BASELINE AGSE/PAYLOAD DESIGN

- **The AGSE will be responsible for:**
  - autonomously loading the payload into the vehicle's payload bay
  - raising the vehicle into a near-vertical launch position
  - inserting the motor igniter in preparation for launch.

- **Begins with vehicle secured to the launch rail in a horizontal position with the payload bay door opening upward.**
- **Pick up the sample capsule, raise it above the vehicle, and drop it into the payload bay**
- **Payload bay doors will automatically close once capsule has been placed inside and will lock shut**
- **Uses servo motors to raise the launch rail into a near-vertical position in preparation for launch**
- **Motor Igniter Insertion System will autonomously insert the igniter into the motor.**
- **The AGSE will then activate a "Ready to Launch" light, after which the hard-wired remote launch button will be used to ignite the motor and begin the flight.**

# AGSE/PAYLOAD VERIFICATION AND TEST PLAN OVERVIEW

- Test that payload fits within given parameters
- Verify all components are manufactured as designed
- Verify full-scale test flight proves that the AGSE can carry out its mission objectives within the set time limit

# THANK YOU!