



# Launch Vehicle Design for the FAR-Mars Competition

## FAR-Mars Competition

- . Hosted by the Friends of Amateur Rocketry (FAR) and the Mars Society.
- . Undergraduate teams must design, build and launch a liquid bi-propellant rocket.
- . Target altitude of 45,000 feet above ground level.



### Competition Overview

Qualification Altitude	30k-50k ft
Max Total Impulse	9,208 lbf-sec
Payload Mass	2.2 lbm
Prize	\$50,000
Vertical Test Date	February 1, 2020
Launch Window	April-May 2020

## Janus Rocket Engine

- . Designed and tested by capstone team Tiber Designs in 2018-2019.
- . Built along with Test Cell 3, a liquid rocket engine testing facility.
- . Janus will propel the vehicle designed by Zenith Propulsion

### Janus Overview

Nominal Thrust	1000 lbf
Fuel	Jet-A (kerosene)
Oxidizer	Liquid Oxygen
Injector	Ox-Centered Pintle
Cooling Methods	Ablative & Fuel Film
Manufacturing	100% In-House



## Altair Launch Vehicle

- . Designed by the Zenith Propulsion team.
- . Aluminum internal skeleton provides support for tanks, feed system, payload and recovery system.
- . Composite aeroshell provides bending strength, protects internal components from in-flight environment and resists aerodynamic loading.

### Altair Overview

Loaded Mass	169 lbm
Propellant Mass	45.7 lbm
Length	21 ft
Boost Duration	10 seconds
Simulated Apogee	30,090 feet
Max Velocity	Mach 1.7

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Mentor: Dr. Daniel Dannelley

