Friends of Amateur Rocketry

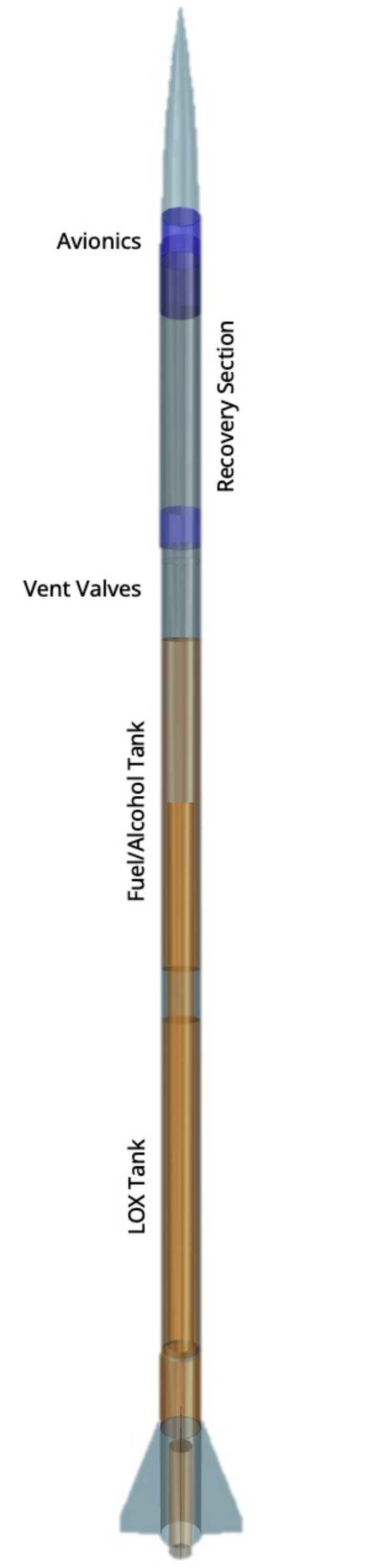
LR-1

"The Student Kit Rocket"

x 10

LIQUID

LAUNCHED



LBS	88.5 lbs. dry / 132 lbs loaded
	19 ft long 6" diameter
	CP = 15.7' / CG = 11.5' loaded

Design/Build → Water Flow Engine → Static Fire Engine → Water Flow Rocket → Static Fire Rocket → Launched

PROJECT OBJECTIVES / GOALS

The LR1 student kit rocket is being developed to provide university teams with a ready-built platform that can be used to rapidly learn and launch their first liquid rocket. It is a "no frills" two tank blow-down LOX/Alcohol rocket in a 6" airframe with a 500 lb ablative cooled engine. It is designed for low-cost reuse and basic operation. It has a maximum altitude of 13,500 feet with a motor burn time of 15-18 seconds. LR1 is a collaboration between Friends of Amateur Rocketry (FAR), Flabob Airport, Honkawa Rocketry, Ventury Energy Systems, and others. The rocket has completed three successful flights and multiple static fires and is in the final stages of production.

ROCKET SPECIFICATIONS

Actual/Tested Performance

Altitude:	13,500'
Thrust/Weight Ratio:	4:1
Maximum Velocity:	800 ft/sec
Maximum Acceleration:	4.1 G's

Airframe Material:	Aluminum Fiberglass
Nose Cone:	4:1 Ogive Fiberglass
Fins:	4 x .25" Aluminum
Structure:	Monocoque
TVC / Stabilization:	None

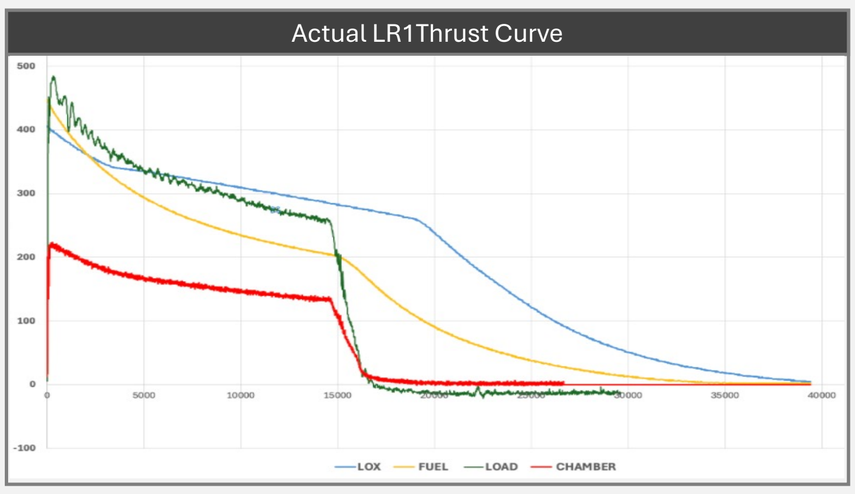
PROPELLANT

Oxidizer:	LOX – Liquid Oxygen	Mass: 25 lbs.	**2 Tank Blow Down**
Fuel:	Ethanol/Methanol (50/50)	Mass: 19 lbs.	
Pressurant:	Nitrogen		LOX
O/F Ratio:	1.35:1		CNG
Ox Tank Volume:	.70 cubic ft. / ullage 50%	Wall: Aluminum .25"	
Fuel Tank Volume:	.70 cubic ft. / ullage 50%	Wall: Aluminum .25"	

ENGINE / PROPULSION

Actual/Tested Performance

Max Thrust:	500 lbs.
Burn Time:	15-17 seconds
Specific Impulse (Isp):	113 s
Total Impulse:	22,000 Ns
Chamber Pressure:	200-140 psi
Chamber Diameter:	4"
Nozzle Throat:	1.75"
Injector Type:	tbd
Cooling Method:	Ablative / Fiberglass
Manufacturing:	Machined



RECOVERY

Altimeters:	TeleMega (primary) Eggtimer Proton (backup)
GPS/Tracking:	TeleMega GPS tracker
Special Hardware:	Tender Descender

Main Parachute
22' Rocketman
2000' deploy

Drogue
5' Ballistic
+ 4' Pilot

GROUND SUPPORT SYSTEMS (GSE)

Control Type:	Direct control Custom Arduino-based MCU
Software:	Custom GSE Software

GSE/Rocket Safety Systems
- Relief Valves
- Vent valves
- REDS integration (Emergency depressurization)

WHAT MAKES THIS ROCKET SPECIAL?

- It is designed to be a basic pre-built kit rocket for students
- It is designed to be reliable with low-cost and rapid reuse

CURRENT STATUS / TEST RESULTS

- LR1 has completed three test flights
  - TF1 was successful but the main chute failed to deploy resulting in a hard landing and some minor damage.
  - TF2 and TF3 were both very successful flights with minor anomalies
- LR1 has completed three static fires (two rocket and one engine)
- The next version (Block 2) is being built and will serve as the production version for students

✅	Design/Build
✅	Static Fire Motor
✅	Static Fire Rocket
✅	Launch

Updated 8/9/2024