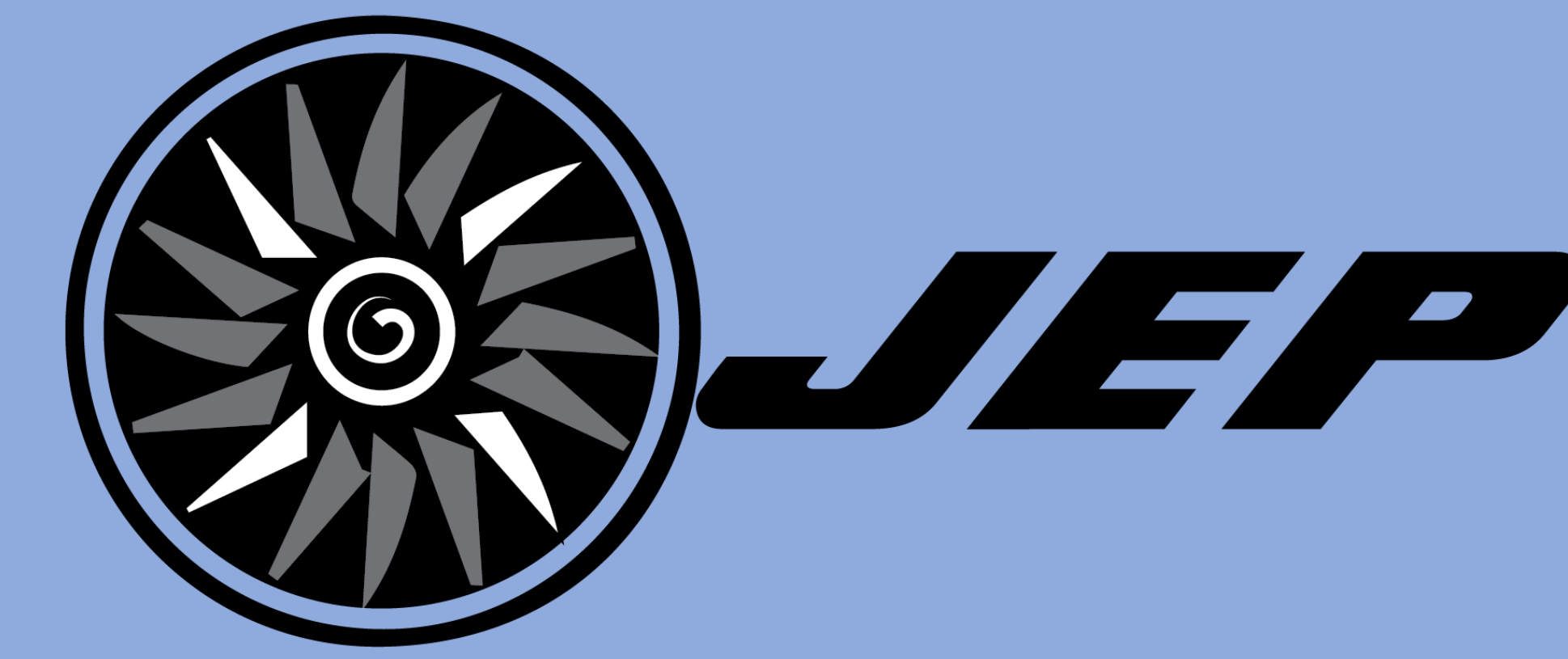




A Novel Approach to Modular Ramjet Engines



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Background

This project is operated under the organization Experimental Jet Engine Propulsion (XJEP). XJEP focuses on research and experiments related to air breathing jet engine propulsion. XJEP has completed and has ongoing projects related to test cell design, thrust augmentation, afterburner design and testing, and now ramjet design.

The afterburner and ramjet engine are designed to be modular. This concept was chosen to provide a platform for future research to club members. To test a new flameholder geometry or fuel injector positioning only a new component would need to be manufactured, not an entirely new afterburner or ramjet. The modular design saves time and money during the manufacturing period.

This project plans to test and compare a traditionally manufactured and an additive manufactured ramjet inlet

Engine Statistics

Parameter	Value
Area	8.553 in ²
Size	3 in x 3 in x 14 in
Ramp Design	5° & 15°
Inlet Mach	1.3
Compression Ratio	.92
Projected thrust	85 lbf

Project Goals

- 1.The first goal of the project is to design, manufacture, and successfully operate a modular ramjet engine
- 2.The secondary goal is to compare flow separation, shockwave formation, and specific thrust between a conventionally machined inlet cone, and one produced with additive manufacturing

Current Standing

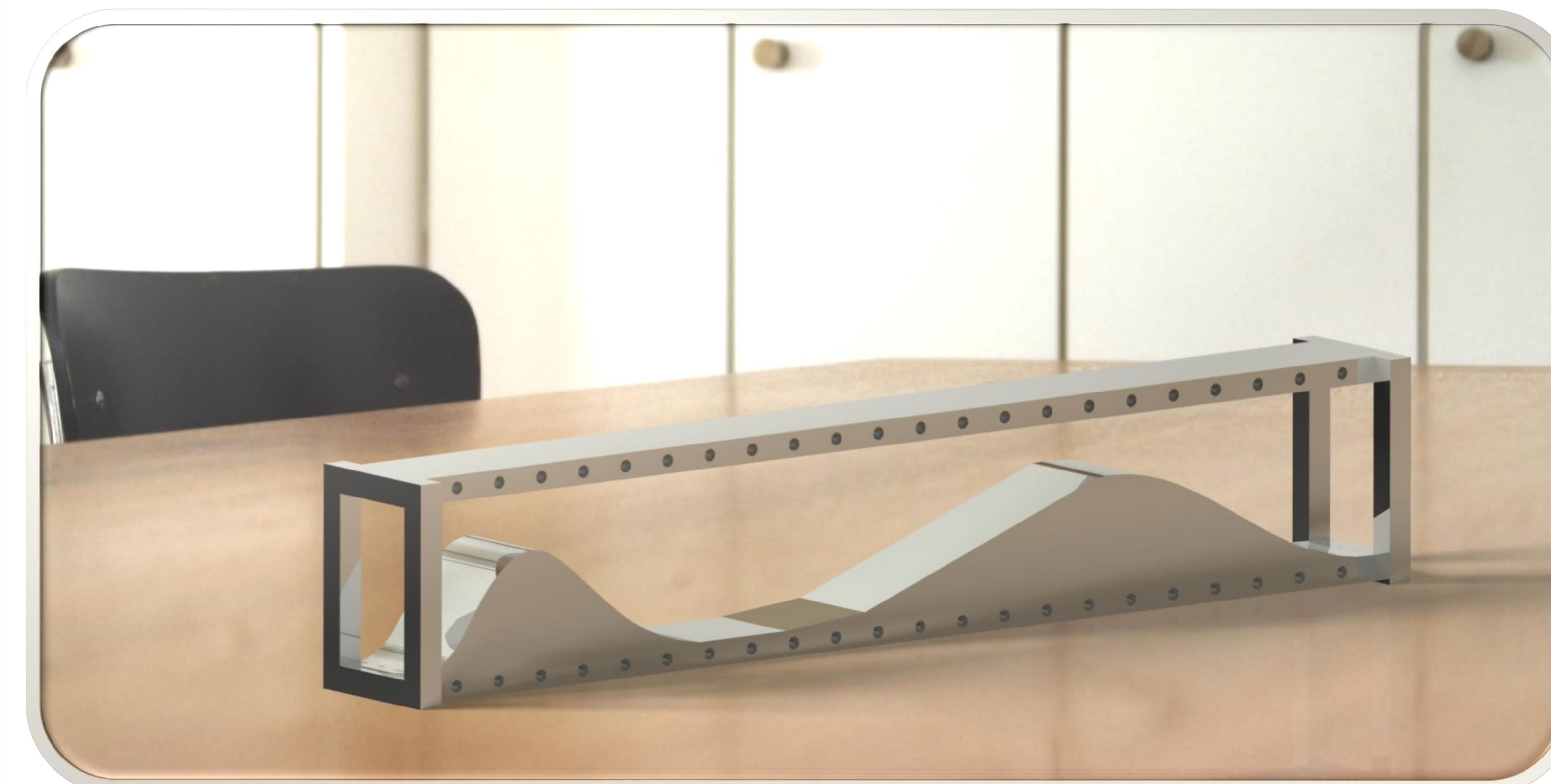
Final design for the inlet is being performed at the time of this presentation. Multiple initial iterations were completed throughout the semester with this design being chosen. The two pictured designs are for different types of wind tunnels. The direct connect ramjet contour is the design being manufactured and tested in the upcoming future. While the inlet was designed, other sub-groups worked on designing other engine components (fuel injectors, flameholder, combustion chamber, & nozzle), computational flow dynamics (CFD), and instrumentation and implementation plans.

Next Steps

Finalizing the design, manufacturing the models, and testing the contour models are the next steps planned to be taken. It is planned to have the models manufactured by the end of this semester with testing being performed over break and into early next semester. The next phase of manufacturing, assembling, and testing the entire ramjet will commence after the prior testing is commenced.



Rendering of the inlet model of the ramjet



Rendering of the direct connect contour of the ramjet