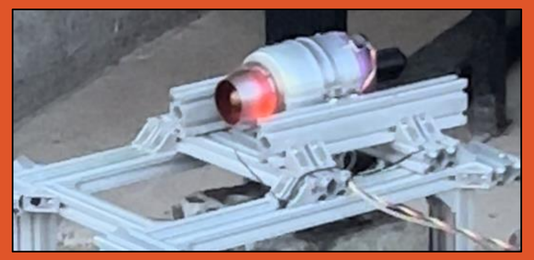


TESTING

- 5 different sized intake shrouds were 3D printed to test on the engine
- 5 fans with different diameters were fitted into their matching shroud
- The engine was run multiple times with each different pair of intake shroud and fan
- Thrust data was collected with a strain gauge and a voltmeter
- Higher voltage readings from the strain gauge meant greater thrust produced by the engine
- Electrical power generated by the spinning fan was routed to a 12V output.
- The best intake shroud and fan pair was the one that generated the most thrust while maintaining a low overall weight

Oregon State University

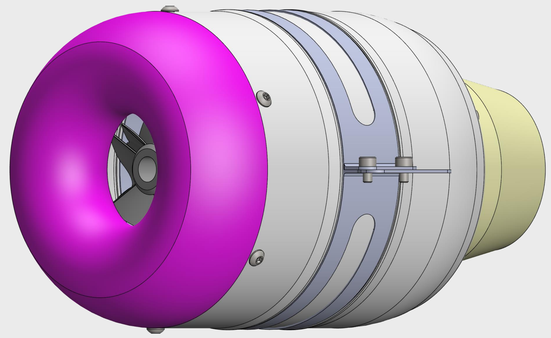
APOP

Aerospace Propulsion Outreach Program

Raquel Coburn, JP Miska, Travis Sundseth, Ziyi Jian

PROJECT GOALS

- Maximize thrust produced by the engine
- Minimize weight while maintaining maximum thrust
- Generate 80W of DC power at idle
- Generate 500W of DC power at full throttle
- Create a “digital twin” via code that accurately models the performance of the engine

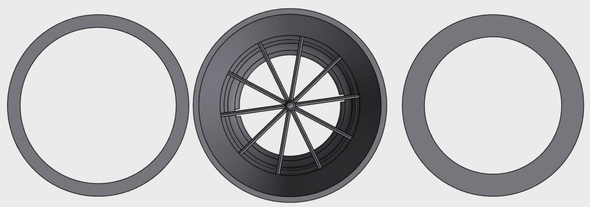


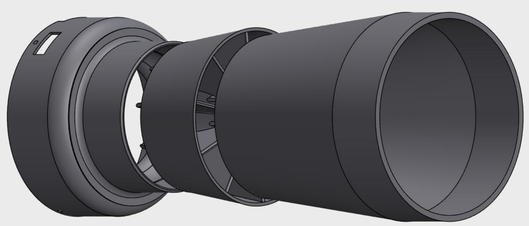
DESIGN CONCEPT

In order to generate electrical power with the engine, an intake shroud that contained a ducted fan was installed at the front of the engine. As air is sucked into the engine through the new intake shroud, a fan inside of the shroud, which is connected to an external power conversion unit, spins to generate electrical power.

This design is similar to the concept of wind turbines, but rather than using only wind power, the engine is used as the driving force that generates the wind needed to spin the fan.

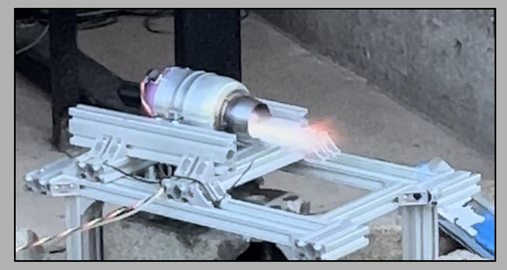
To insure the best air flow possible, veins were implemented inside of the shroud. This helped to reduce turbulent flow, and improved engine performance.





FINAL RESULTS

- The intake shroud and fan pair that produced the greatest amount of thrust while maintaining the lowest possible weight was the 70mm intake and 70mm fan.
- This pair produced a strain gauge reading of 4.82V
- The total weight of this pair was 1.07kg
- The stock engine thrust-to-weight ratio was recorded as 9.4
- The engine with the modified intake shroud and fan had a thrust-to-weight ratio of 9.2
- Although thrust-to-weight ratio was reduced, the addition of an intake shroud and fan fulfilled the other project objective
- A digital twin of the engine was created via MatLab to model the performance of both the stock engine and the modified engine
- Power generation by the engine was achieved by connecting the fan to an external 12V device that was powered by the fan’s rotation



APOP 22-23 IN THRUST WE TRUST OSU