Tesla Pulsejet Engine

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ME 4371
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Introduction:

A Pulsejet Engine is an engine that pulses the thrust and combustion with little or no moving parts. These engines are very inefficient due to significant heat loss, vibrations and noise. A Tesla valve is designed as a check valve with no moving parts by relying on the direction of flow.

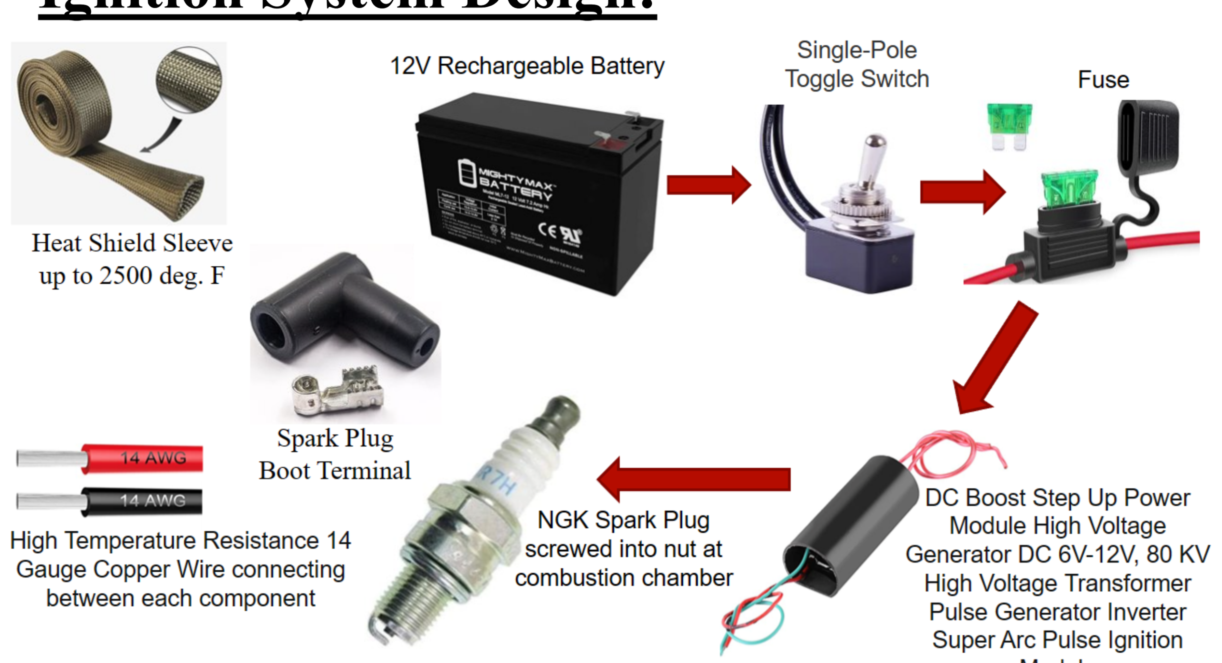
The Tesla Pulsejet Engine was designed to investigate the use of a Tesla valve as a control valve before the intake on a Giant Chinese Valveless Pulsejet Engine. The device consists of the mechanical engine body system, mechanical fuel system and electrical ignition system.

Problem Statement and Requirements:

The purpose is to analyze the pulsejet engines capabilities suc h as propulsion, fuel consumption, and temperature with and without the Tesla valve. Ultimately, to determine if the Tesla valve works effectively as a control valve in this application and increases the efficiency of the Giant Chinese Valveless Pulsejet Engine.

- Construct using corrosion resistant parts
- Weight should not exceed 40 lbs. alone, not including fuel or fuel tank
- Produce a minimum 15 pounds of thrust
- Length should not exceed 6 feet
- Fasten securely to structure while maintaining accessibility for maintenance and
- Move a normally man-powered device 25 feet

Ignition System Design:

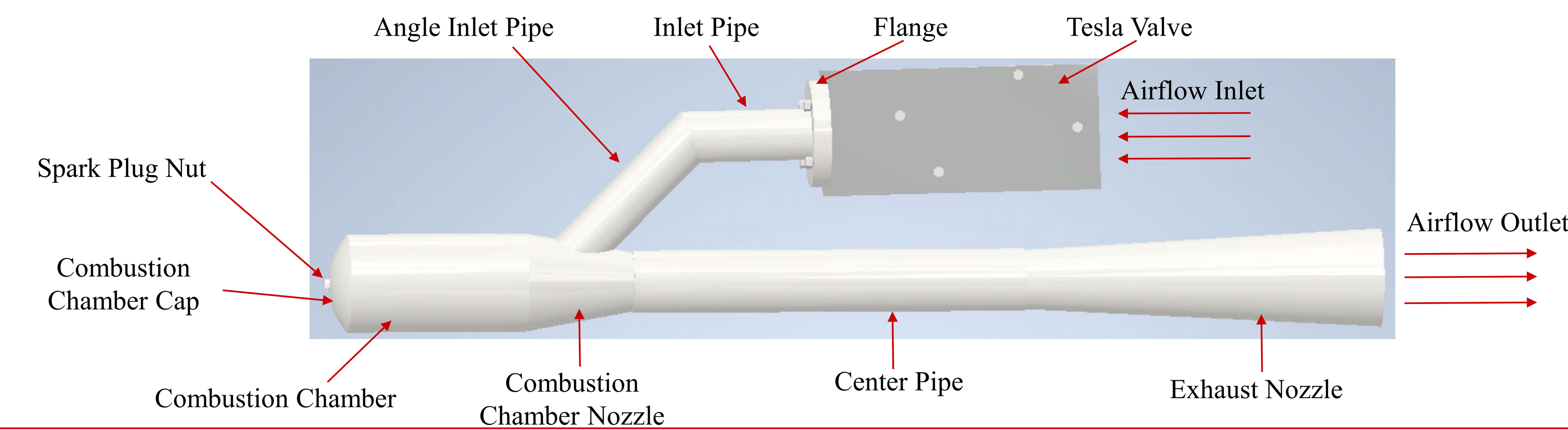


Using a very basic ignition system we start with a 12V battery that goes to a DC boost step up power module to power a used car spark plug with the with one lead of the booster going to the spark plug and the other grounding the combustion chamber

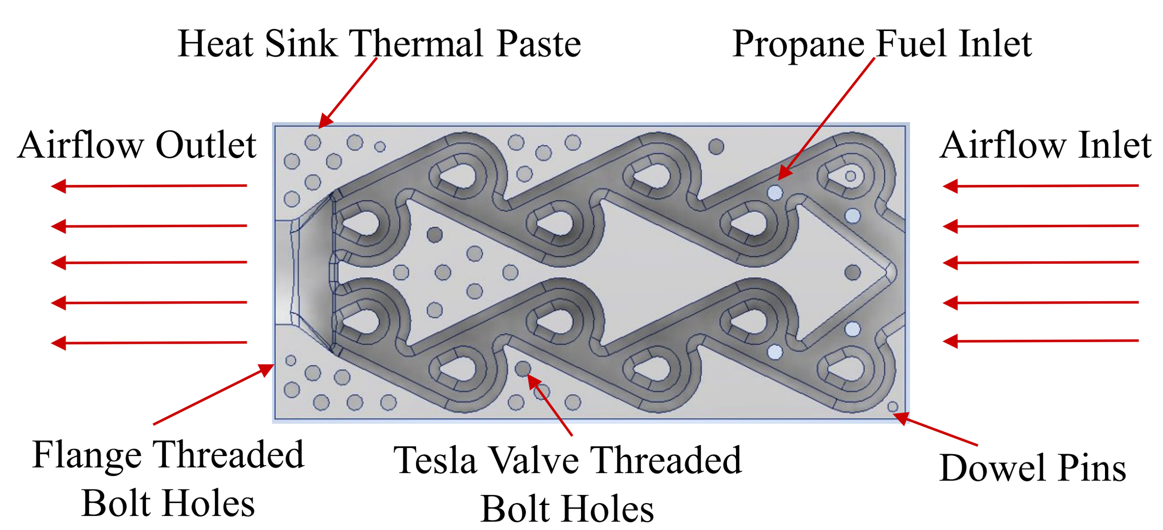
Engine Design:

The engine is based on the 12 lb. Giant Chinese Valveless Pulsejet Engine with dimensions increased by a ratio of 1.3 with slight adjustments to ensure it will run similarly with more thrust. The length of the entire engine is about 60".

- Flange is 0.75" depth with slotted holes at a 4.5" diameter bolt circle.
- Inlet Pipe longest side is 7.5" long, 2.469" inner diameter, and 2.875" outer diameter.
- Angle Inlet pipe longest side is 10" long, 2.469" inner diameter, and 2.875" outer diameter.
- Combustion Chamber Cap is 5.25" diameter and domed with the spark plug nut welded in the center.
- Combustion Chamber is 10" long, 5.25" inner diameter and 5.563" outer diameter.
- Combustion Chamber Nozzle is 6.5" long, going from a large diameter of 5.563" to small diameter of 3.5".
- Center Pipe is 22" long, 3.068" inner diameter, and 3.5" outer diameter.
- Exhaust Nozzle is 20.5" long, going from a small diameter of 3.5" to large diameter of 5.563".

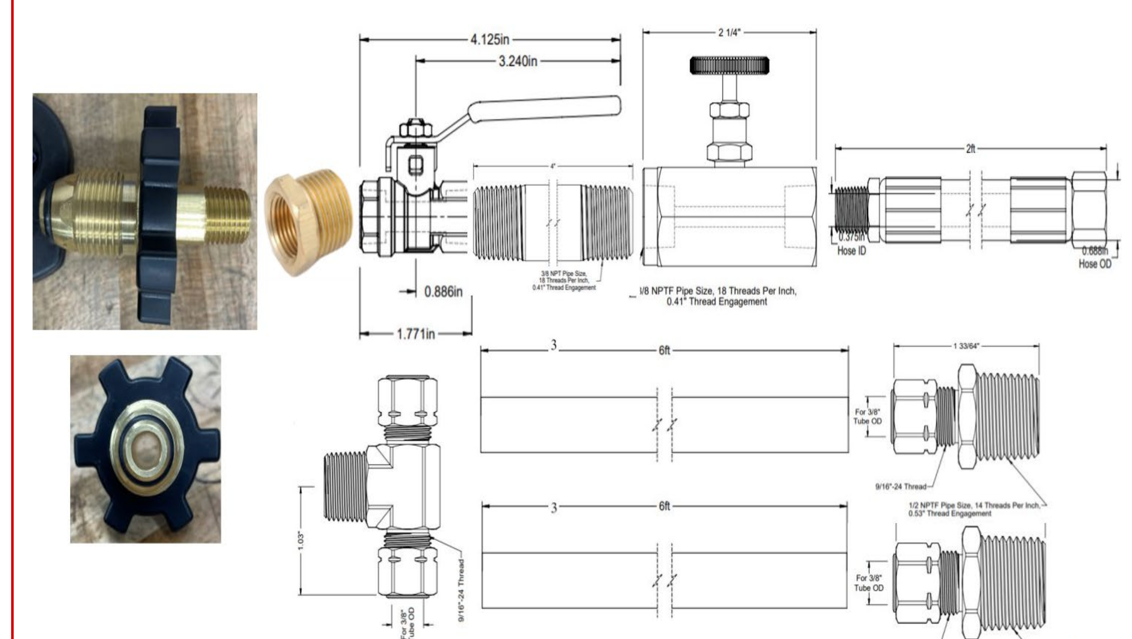


Tesla Valve Design:



The Tesla valve is designed in two half's which are placed together to get the entire Tesla valve that is placed on the engine. One half of the Tesla valve is 15.5" x 7.5" x 3.5". The entire Tesla valve is 15.5" x 7.5" x 7". The Tesla valve has dowel pins to line up each half with one another to then be bolted together. Then is attached to a flange of the engine inlet. The fuel is inputted at the beginning of valve and at the end of the valve 3/8" holes are drilled to place heat sink thermal paste in attempt to protect the geometry of the Tesla valve form the heat of the combustion chamber. The design of the Tesla valve has a 0.75" wide and 1.75" deep chamber. The angle which the curve section of the valve is 52 degrees.

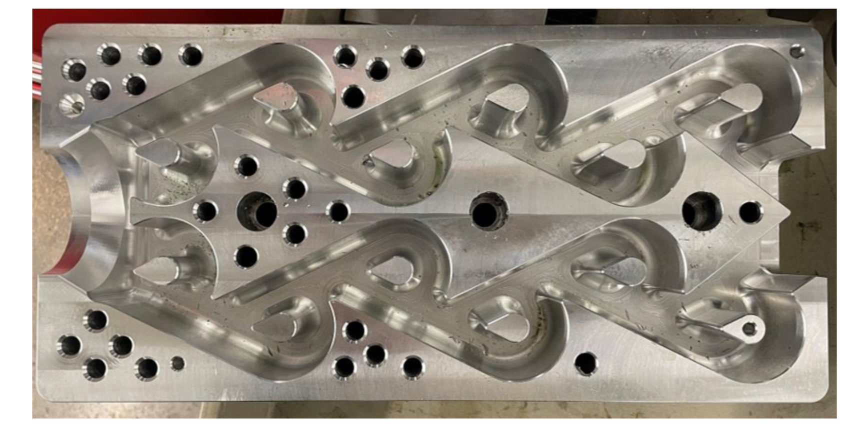
Fuel System Design:



Using propane as the fuel source for this project we found a connection that didn't have a preinstalled limiter so that we have full control on the fuel air ratio being fed to the Tesla valve. A ball value is used as an instant kill switch for safety and a needle valve for precise control. Then a 5-foot extension for safety precautions is installed. A tee is installed to split the fuel flow into two going into each chamber of the Telsa valve. If the engine needs more fuel, we have the option to install 4 inlets of fuel

Manufacturing:

The majority of manufacturing, was done with CNC milling to get the difficult dimensions and design required for the Tesla valve.



However, many hours in the welling booths, joining sections together, manufacturing of conical pieces using strap metal and grinding.

The lathe was a key tool in the production of this project. We bored out the inner diameter of combustion chamber pipe, cleaning rust off donated pipe, and manufacturing of the flange. Additionally, a drill press was used to create many of the bolt holes used in this project.

Handheld plasma cutting torch was used to create openings for our inlet pipe, curvature on angle inlet pipe and to remove jig scrap metal used to create our conical sections.

A hydraulic press was employed for the doming of the combustion chamber cap.