PULSAR FUSION

LIQUID HYDROGEN ROCKET ENGINE

DATA SHEET

LIQUID HYDROGEN (LH2)

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PRODUCT DESCRIPTION

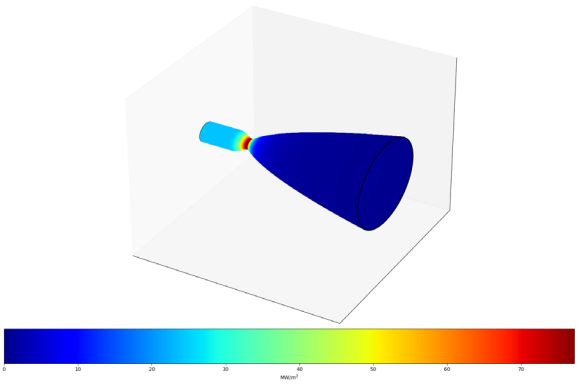
The Pulsar liquid hydrogen liquid oxygen (Lox/LH2) rocket engine differentiates itself from other liquid rocket engines through higher performance and its ability to support global growth in the space industry while also having credentials to demonstrate it is carbon neutral.

Hydrogen, while more challenging to handle than other cryogenic propellants such as methane and liquid oxygen, offers many specific benefits for Pulsar's vision.

Hydrogen engines offer sales potential to small and larger launch service providers alike: customers for upper stage hydrogen engines currently exist in the UK, Pulsar is aiming to manufacture and supply six engines per annum to clients in our first year.

Hydrogen rocket engines are likely to generate value for future in-space transportation missions, for example to the Moon and Mars, and will provide essential experience in handling liquid hydrogen, the most promising propellant for Pulsar's fusion drive roadmap.

Furthermore, very few organisations exist in the UK with hands-on experience with liquid hydrogen. The aviation industry is set to begin decarbonising over the next decade, and liquid hydrogen powered aircraft development will be a significant part of that.



Engine Details

Propellants	Liquid Hydrogen / Liquid Oxygen
Thrust	15kN
Specific Impulse	4225ms-1 / 430s
Chamber Pressure	2 MPa / 20 Bar
Chamber Dimensions	300mm length x 160mm width
Nozzle Dimensions	850mm length x 66cm width
Expansion Area Ratio	80
O/F Ratio	4.83

TIMELINES

Pulsar is currently manufacturing the first range of LH2 engines at its Bletchley facility and has secured a test site in Q2 2023 for demonstration of its 15 kN static launcher in Scotland followed by a VTOL demonstration in Q4 at our existing text site in Switzerland. Feed system design is complete and the first Pulsar LH2 rocket chambers will be available for demonstration in Q4 2022.

APPLICATION

Liquid hydrogen is the highest performance chemical propulsion fuel, stemming from its low molecular mass and high heat of combustion. This allows hydrogen rocket engines to deliver the most payload when used for launch and in-space transportation. Major spacefaring nations of the world have occasionally used LH2 in their vehicles, however its perceived costs and complexity have limited its usage primarily to upper stages of launch vehicles. There is now a growing demand for clean, powerful propulsion systems post deployment. Applications include Stage 2 propulsion, Upper stage for small launchers currently using non cryogenic propellants, In Space transportation, Lunar Gateway resupply / Asteroid Mining.

The growth in satellite launch service demand is stimulating propulsion developers to rapidly introduce new launchers. Seven new vehicles were reported in 2019, the highest in a single year since 1999.

THRUST GENERATION

The Pulsar LH2 engine has a design thrust of 10,000-15,000 Newtons, initially pressure fed from stored gas and then further developed to be pump driven. It is projected to comfortably exceed the performance of any equivalent engine in Europe.

ENGINE SCHEMATIC