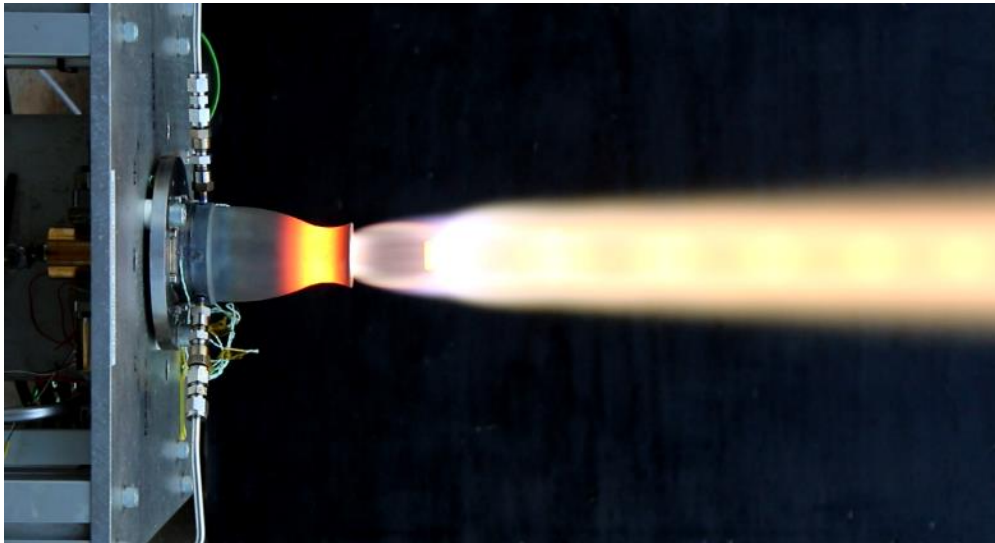


LEROS 4 Apogee Engine

- Bipropellant Liquid Thruster



The LEROS 4 thrust chamber concept being tested

The **Nammo Space** designed and manufactured **321 second Isp**, MON/ Hydrazine apogee engine delivers a thrust of **1000N**.

The **Nammo Space LEROS 4** engine has a thrust range between 900 N and 1100N. This new development is often referred to as the High Thrust Apogee Engine, or HTAE.

The engine is being prepared for its first in-vacuum hotfire tests in the National Space Propulsion Test Facility at Westcott.

The High Thrust Apogee Engine is been designed as a mission enabling, propellant optimizing engine targeted at ESA deep-space Mars-return missions and has undergone extensive development and hotfire testing.

The engine also includes specifically designed high flow engine valves, manufactured and supplied by Nammo Ireland.

All Nammo apogee engines are hot-fire tested in the UK **National Space Propulsion Test Facility** at Nammo Westcott.

High altitude testing and qualification testing is due to be completed in 2021.



LEROS 4 Design

LEROS 4 Apogee Engine

- Bipropellant Liquid Thruster

Typical Application	Planetary missions, sample return missions.
Typical Operational Mode	Long duration burn(s), with some pulsing capability
Propellant	MON-3/MMH
Thrust Range	900 N - 1100 N [202 lbf to 247 lbf]
Thrust, nominal inlet pressure	1000 N [225 lbf]
Mixture Ratio Range	1.5 to 1.8 [oxidiser to fuel]
Mixture Ratio	1.65, at nominal inlet pressure
Specific Impulse	321 seconds minimum
Total Impulse	13,600,000 Nsec
Propellant Throughput	>4,229 kg
Mission Burn Duration	12,364 seconds
Margin on Performance	1.25
Inlet Pressure	15.4 bara nominal [223 psi]
Restarts Demonstrated	70 off with Chamber temp. <100°C [start], >1300°C [finish]
Maximum Duration Single Firing	3,600 seconds for qualification
Engine Mass	8.41 kg +/-10%
Operating Temperature	1350°C
Propellant Temperature	0°C to 40°C
Storage Temperature	-50°C to +65°C
Storage Life	4 years
Operational Life	19 years
Reliability	0.995
Valve Type	2 off Solenoid, Single Seat, Redundant Coil
Valve Voltage	18 Vdc to 27 Vdc
Technology Readiness Level	In development, TRL6



Nammo (U.K.) Limited,
47 Westcott Venture Park, Westcott,
Buckinghamshire, HP18 0XB, UK.

Adam Watts
Strategic and Business Development
+44 7768 952290
adam.watts@nammo.com