LEROS 2b Apogee Engine

- Bipropellant Liquid Thruster

The **Nammo Space** designed and manufactured **320 second** Isp, MON/ Hydrazine dual mode apogee engine delivers a thrust of **420 N**.

The **LEROS 2b** has flown on the NRL Mitex Mission and the 2019 SpaceIL/IAI Beresheet lunar Lander mission.

The LEROS 2b used for the Beresheet mission utilized an innovative ALM support structure / heatshield and the engine successfully performed the orbit raising and lunar orbit insertion manoeuvres.

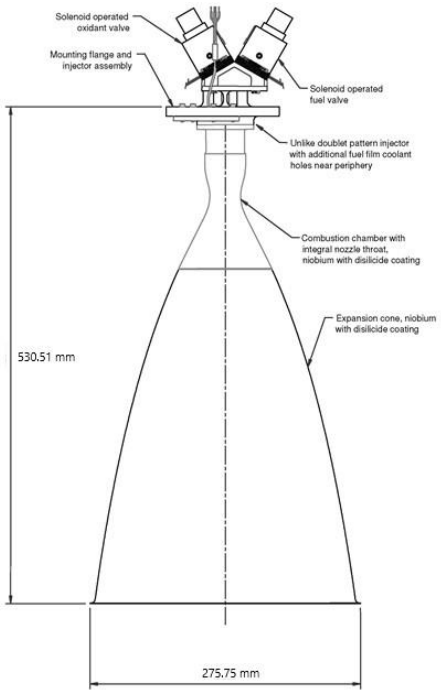
This is a cost-efficient, high performance bipropellant engine.

The base material for the thrust chamber and expansion cone is C103 Niobium alloy, coated with R512E Disilicide for oxidation protection.

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

Delivery timescales are typically 12 to 18 months.

LEROS 2b with heatshield and Additive Manufactured support structure.



LEROS 2b envelope dimensions

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Typical Application	Apogee engine or main delta V engine
Typical Operational Mode (Flight proven)	Long duration burn(s) e.g. 3 x 4000 sec Pulsing capability/Modulated firing capability
Propellant	MON/MMH
Thrust Range	367 N to 456 N [83 lbf to 103 lbf]
Thrust at Nominal Inlet Pressure	420 N [95 lbf]
Mixture Ratio Range	1.43 to 1.81 [Oxidiser/Fuel]
Mixture Ratio, Nominal Inlet Pressure	1.65 [Oxidiser/Fuel]
Specific Impulse	319.5 s typical. 318.5 s minimum at 15.4 bara
Specific Impulse	320 s minimum at 17 bara
Total Impulse	>12,000,000 Nsec
Propellant Throughput	>4000 kg
Inlet Pressure, Nominal	15.4 bara [223 psia]
Inlet Pressure Range	13.5 bara to 17.9 bara [196 psia to 260 psia]
Restarts Demonstrated	75 [Chamber temp. <100°C start, >1300°C finish]
Maximum Duration Single Firing	6,600 seconds Demonstrated in Qualification
Cumulative Duration, Qualified	> 30,600 seconds
Engine Mass	5 kg [typical]
Operating Temperature	1350°C
Propellant Temperature	+4°C to +40°C
Storage Temperature	-53°C to +65°C
Storage Life	4 years
Operational Life	19 years
Reliability	0.995
Valve Type	2 Solenoid Valves, Single Seat, Redundant Coil
Qualified Valve Cycles	10,500 on/off cycles
Valve Voltage per Coil	19 Vdc to 27 Vdc
Technology Readiness Level	TRL9

Note: The thruster can be connected fuel/ox primary coils in parallel (24Vdc) or in series (50Vdc)

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