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AZO Space of Innovation

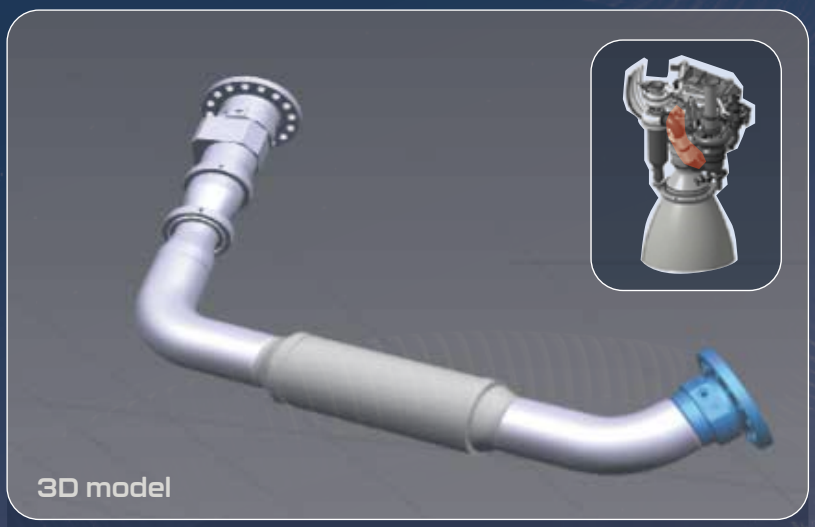
ENLIGHTEN

A more efficient and competitive way to space,
leading to new possibilities in the sky and on earth

Funded by the European Union

Factsheet #4

High-Pressure Multi-Functional lines



3D model

The High Pressure Multifunctional Lines (HP-MFL) represent a significant advancement in space propulsion technology, designed to substitute or improve upon the existing Vulcain 2.1 engine components.

Traditional space propulsion systems often rely on complex and costly mechanisms, such as gimbals, to manage fluid flow and thermal expansion. The HP-MFL aim to simplify this design by integrating lines that can transport high-pressure hydrogen and oxygen efficiently from the turbopumps to the combustion chamber.

The HP-MFL are designed with a focus on reducing the number of components and optimizing the materials used. The integration of sensors and flexible components allows for real-time monitoring and adjustment, ensuring optimal performance and safety.

Companies involved

ArianeGroup — FR

NEXTEAM GROUP — FR

Key parameters

Pressure and Temperature

The HP-MFL are designed to operate at high pressure up to several hundred of bars and under cryogenic temperature, ensuring reliable fluid transport under extreme conditions.

Cost Reduction

By eliminating unnecessary components like gimbals and optimizing the design, the HP-MFL aim to achieve significant cost savings.

Multifunctionality

The addition of sensors such as hydrogen-compatible mass-flow meter allows the piloting of the engine thrust.

from **TRL 3**
maturity level limited to concept and analytical justification

to **TRL 5**
after hardware production and test in a representative environment

Pros and Cons

⊕ Efficiency
The HP-MFL simplify the fluid transport process, reducing the number of components and improving overall efficiency.

⊕ Cost Reduction
By eliminating unnecessary components and optimizing the design, the HP-MFL aim to achieve significant cost savings.

⊕ Versatility
The HP-MFL can be adapted for use in other engines, making them a versatile solution for future engines.

⊖ Material Limitations
The material may have limitations in terms of availability and cost.

Expectations for testing phase

Pressure and Temperature Stability

The lines will be tested for their ability to maintain stable pressure and temperature conditions under various operational scenarios.

Mass Flow Measurement

The integrated mass flow meter will be calibrated and tested to ensure accurate measurement and control of fluid flow.

Flexible Component Performance

The flexible components, such as elbows and braided bellows, will be evaluated for their ability to withstand thermal and mechanical stresses without failure.

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