

# ORPHEE

Innovative propellants in hybrid propulsion technology and its applications in space transportation

## REINVENTING THE ROCKET

*Getting to space safely and precisely is paramount. Hybrid rocket propulsion might contribute in this respect, by combining the advantages of solid- and liquid-fuelled rocket engines. The project ORPHEE seeks to improve hybrid rocket performance and ensure that Europe remains a key player in this innovative propulsion technology.*

Take one part fuel, one part oxygen, mix well and ignite. Use the resulting hot gases to propel forward. It's a recipe for success, and has been used by rocket builders since the 13th century. **The key ingredient is the oxygen** – rockets carry this on board in the form of an oxidizer, making them different than air-breathing car and jet engines.

**Solid or liquid?** This is the first question to ask when selecting rocket ingredients. Rockets usually employ either a solid fuel-and-oxidizer mixture like gunpowder, or liquid fuel and liquid oxidizer. **An innovative third variety**

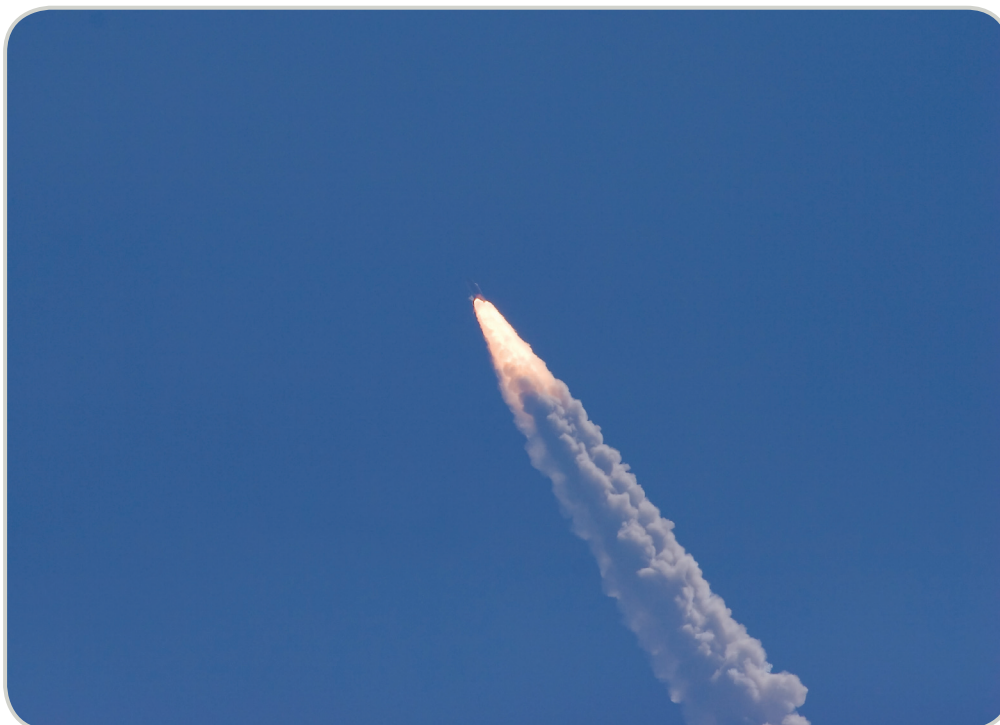
**is the hybrid rocket**, which burns a liquid oxidizer with a solid fuel. This combines some of the best features of both: the solid component adds simplicity and lowers cost, while the liquid part allows for an adjustable throttle, adding precision to orbit insertion and safety.

ORPHEE will enhance European competence in hybrid rocket technology and advance its development, raising its Technological Readiness Level (TRL) from 1 to 3.

Moreover, the project seeks to significantly increase hybrid rocket engine performance. The availability of cutting-edge hybrid-rocket technology in Europe paves the way for future space missions, potentially reducing the global engine cost, whilst also increasing safety of future space transportation means.



**FRÉDÉRIC DAUCH**  
IS PROJECT COORDINATOR



ORPHEE will enhance European competence in hybrid rocket technology, aiming for breakthroughs in the field of propulsion systems for space transportation vehicles.  
Source: Joe Stone © Fotolia

## QUESTIONS & ANSWERS

### What do you want to achieve with this project?

The main objective of the ORPHEE project, led by SNPE Matériaux Energétiques, is to achieve breakthroughs in the field of hybrid propulsion systems for space transportation vehicles.

### Why is this project important for Europe?

ORPHEE will induce a new space mission definition with an innovative propulsive system. It will contribute to developing new methods and techniques providing European industry with competitive advantages regarding newcomer countries in the space community.

### How does your work benefit European citizens?

ORPHEE project achievements will benefit European citizens through their contribution to sustaining European industry employment on innovative technologies development, as well as benefits in the field of environmental and safety aspects with development of hybrid propulsion systems.

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## LIST OF PARTNERS

- SNPE Matériaux Energétiques, France
- Astrium SAS (Astrium ST F), France
- Astrium GmbH (Astrium ST G), Germany
- Avio S.p.A. (AVIO), Italy
- Office national d'études et de recherches aérospatiales (ONERA), France
- Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Germany
- Politecnico di Milano (POLIMI), Italy
- Università degli Studi di Napoli Federico II (DIAS), Italy
- Universitatea Politehnica din Bucuresti (UoB), Romania
- Thyia Tehnologije d.o.o. (THYIA), Slovenia

## COORDINATOR

**SNPE Matériaux Energétiques, France**

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## PROJECT INFORMATION

Innovative propellants in hybrid propulsion technology and its applications in space transportation (ORPHEE)

Contract no: 218830

Starting date: 01/01/2009

Duration: 36 months

EU Contribution: € 1.984.154

Estimated total cost: € 3.056.570

