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

### Fact Sheet

#### Project Information

<table>
<thead>
<tr>
<th>ORPHEE</th>
<th>Funded under</th>
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</thead>
<tbody>
<tr>
<td>Grant agreement ID: 218830</td>
<td>FP7-SPACE</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Overall budget</th>
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<tbody>
<tr>
<td>€ 3,056,571</td>
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<table>
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<tr>
<th>EU contribution</th>
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<tbody>
<tr>
<td>€ 1,984,154</td>
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</table>

- **Closed project**
- **Start date**: 1 January 2009
- **End date**: 31 December 2011

**Coordinated by**

- HERAKLES SA
- France

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**This project is featured in...**

- RESEARCH*EU MAGAZINE
- Archaeology, history and heritage: a civilisation discovered in Libya’s desert

**No. 9, February 2012**
Objective

Nowadays, chemical propulsion is based on solid (launch applications like first stage booster) or liquid technologies (upper stage engines). Complementary, hybrid propulsion technology, as defined in ORPHEE (Operational Research Project on Hybrid Engine in Europe), appears as a new generation of advanced space transportation system. Engines based on this innovative propulsion concept provide advantages like thrust performance, throttling (thrust modulation), versatility (easy adaptation to various configurations), simplicity, safety, which significantly reduce the global engine cost. It will help to consolidate the long term sustainability and ensure a technology needed by the European propulsion space community to remain independent. Hybrid propulsion principle is based on the injection of a liquid oxidizer into the engine combustion chamber where it reacts with a solid fuel to generate hot gases providing the thrust. Enlarge the burning surface is the current proposed solution to reach the needed performance level. It dramatically increases the solid grain volume and the engine weight, limiting the applications. The regression rate is a key parameter controlling the solid fuel grain design. Its increase is a very attractive solution to reduce the grain volume. The main objectives of ORPHEE are to increase versatility of space propulsion system, ensure significant increase performance of hybrid engine, improve solid fuel technological maturity from TRL 1 to 3 and gather European skills on hybrid propulsion and ensure European access to space. In near future, the availability of new hybrid engines will allow the access to new space transportation missions and to obtain significant costs reduction. It will consolidate the knowledge on this innovative technology, allowing the European space community to become non dependant. It may be considered as a competitive propulsion solution to be implemented in future space agencies roadmaps.

Fields of science
Programme(s)

Call for proposal

FP7-SPACE-2007-1

Funding Scheme

Coordinator

HERAKLES SA

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33185 Le Haillan
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Activity type
Private for-profit entities (excluding Higher or Secondary Education Establishments)

EU contribution
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Philippe Gautier (Mr.)

Participants (9)

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Research Organisations
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DEUTSCHES ZENTRUM FUR LUFT UND RAUMFAHRT E.V.
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Giorgio Mustilli (Prof.)

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<table>
<thead>
<tr>
<th>Administrative Contact</th>
<th>Activity type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teodor-Viorel Chelaru (Dr.)</td>
<td>Private for-profit entities (excluding Higher or Secondary Education Establishments)</td>
</tr>
</tbody>
</table>

**Thyia Tehnologije d.o.o**

**Slovenia**

**EU contribution**

€ 70 400

**Address**

Dimiceva 9  
1000 Ljubljana

**Activity type**

Private for-profit entities (excluding Higher or Secondary Education Establishments)

**Website**

Contact the organisation

**Administrative Contact**

Spase Drakul (Dr.)

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**Last update:** 16 July 2019  
**Record number:** 89263

**Permalink:** [https://cordis.europa.eu/project/id/218830](https://cordis.europa.eu/project/id/218830)

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