European Commission

In-Space Electric Propulsion

Powering the future EU space ecosystem

Europe is well on the way to providing its booming satellite market with a cost-effective, highly efficient low-energy electric propulsion system. This new CORDIS Results Pack highlights the main achievements of a cluster of EU-funded research projects working to achieve this breakthrough.

Research and Innovation

Strengthening Europe's space sector and opening up new opportunities in Earth observation, telecommunications, on-orbit servicing and space exploration are key objectives in the mission to support EU autonomous space access and boost the sector's innovation and competitiveness.

Over the last decade, advances in microelectronics and reduced launch costs have led to an increase in the number of satellites being put into orbit. Tens of thousands of satellites are now planned for launch in the coming years with the aim of improving observation activities, as well as navigation and communications.

12 EU-funded projects help scale EU satellite technology

There are currently more than 5 000 satellites in low-Earth orbit (LEO), circling our planet at altitudes ranging from 200 km to 1 600 km. However, LEO satellites are subject to orbital decay, where their distance from Earth gradually decreases, requiring an efficient low-thrust propulsion system for orbital 'station keeping'.

Electric propulsion is a revolutionary lightweight and highly efficient technology that is uniquely qualified to keep LEO satellites traversing above the globe. This class of space propulsion makes use of electrical power to accelerate a propellant through different possible electrical and/or magnetic currents. As part of the Strategic Research Cluster (SRC) on Electric Propulsion, the projects included in this pack focused on developing this technology and advancing the EU's position in the global space landscape.

AETHER

Air-breathing Electric THrustER
Coordinated in Italy

AETHER focused on air-breathing technology, using residual gases of the upper atmosphere as a propellant instead of on-board propellant.

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ASPIRE

Advanced Space Propulsion for Innovative Realization of space Exploration
Coordinated in Italy

ASPIRE developed a very high power (20 kW) EP system using the Hall-effect technology, which efficiently accelerates ions to produce high thrust.

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CHEOPS LOW POWER

Consortium for Hall Effect Orbital Propulsion System – Phase 2 covering LOW POWER needs
Coordinated in France

CHEOPS LOW POWER developed a low-power (up to 1 kW) EP system using the Hall-effect technology, which efficiently accelerates ions to produce high thrust.

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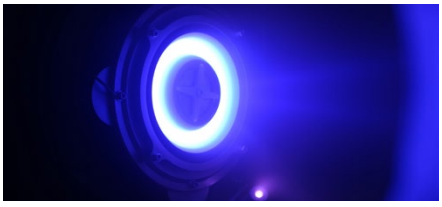
CHEOPS MEDIUM POWER

Consortium for Hall Effect Orbital Propulsion System – Phase 2 covering MEDIUM POWER needs
Coordinated in France

CHEOPS MEDIUM POWER developed a medium-power dual mode (3-7 kW) EP system using the Hall-effect technology, which efficiently accelerates ions to produce high thrust.



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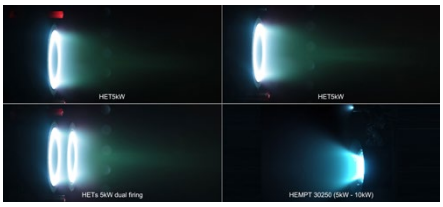
EDDA

European Direct-Drive Architecture
Coordinated in France

EDDA tested how onboard solar arrays deliver electric power to thrusters without the need for a power converter.



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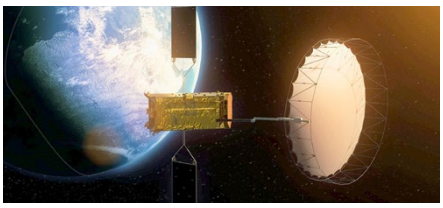
EPIC2

Electric Propulsion Innovation and Competitiveness 2.0 (EPIC2)
Coordinated in France

EPIC2 supported the European Commission in identifying activities that address research challenges for Europe, and assessed projects' activities and results.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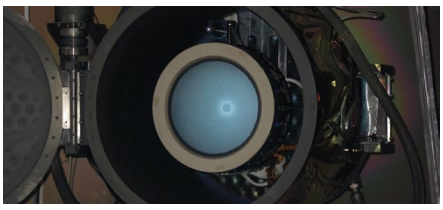
GIESEPP MP

GIESEPP MP - Gridded Ion Engine Standardized Electric Propulsion Platform - Medium Power Solution
Coordinated in Germany

GIESEPP MP developed a medium-power dual mode (3-5 kW) EP system using the Gridded Ion technology, which efficiently accelerates ions to produce high thrust.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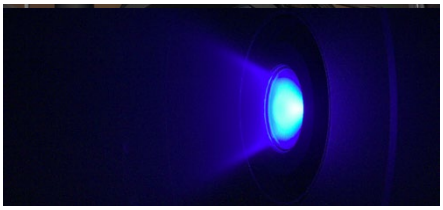
HEMPT-NG2

High Efficiency Multistage Plasma Thruster - Next Generation 2
Coordinated in Germany

HEMPT-NG2 developed an ion propulsion technology based on the use of permanent magnets for plasma confinement.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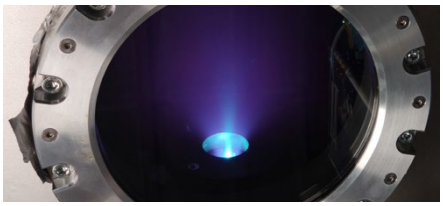
HIPATIA

HelIcon PlasmA Thruster for In-space Applications
Coordinated in Spain

HIPATIA tested an electromagnetic plasma propulsion system for use in non-geostationary satellites and other small spacecrafts.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iFACT

iFACT - Iodine Fed Advanced Cusp field Thruster
Coordinated in Germany

iFACT investigated the use of iodine as a propellant for EP to help reduce fuel costs and volume.


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NEMESIS

Novel Electride Material for Enhanced electrical propulSIon Solutions
Coordinated in Spain

NEMESIS developed an electride-based cathode technology with superior properties to conventional ceramics.


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PJP

Plasma Jet Pack
Coordinated in France

PJP developed a pulsed electrical thruster based on vacuum arc physics that uses a solid metal propellant.


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Electric propulsion technology inaugurates the EU's new space era

Electric propulsion is a key enabling strategic technology for the EU Future Space Ecosystem and for ensuring European global leadership in the areas of in-space operations and transportation. Its development will also reduce Europe's dependency on foreign suppliers of critical space technologies, ensuring its independent access to space.

The use of electrical power enhances the performance of satellite thrusters compared to conventional chemical thrusters. Unlike chemical systems, electric propulsion requires very little mass to accelerate a spacecraft. The propellant is ejected up to 20 times faster than from a classical chemical thruster and therefore the overall system is far more efficient.

This fact is of particular importance for spacecraft intended for in-orbit servicing and transportation missions. High-power electric propulsion systems could also contribute to missions to the moon, Mars and the asteroid belt, as their higher power translates into higher thrust values, compared to chemical propellants or solar energy from onboard panels.

Learn more about
HaDEA - Horizon Europe - Space: bit.ly/4eR5hVt
DG DEFIS – EU Space Research, Development & Innovation: bit.ly/45HvDEZ
DG DEFIS – EU Space Programme: bit.ly/4eGxlue

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