Safran, CNRS and École Polytechnique create joint laboratory for future electric space propulsion

***Paris, November 17, 2023* — The École Polytechnique engineering school, the French national scientific research center CNRS and Safran Electronics & Defense have signed a partnership agreement for a joint laboratory dedicated to the research and development of electric satellite thrusters. The new unit is called COMHET (laboratoire Commun pour l'étude des Hall Effect Thrusters) and will focus on improving HET technology.**

The partnership builds on a long-standing collaboration between the three entities at the Plasma Physics Laboratory (CNRS/École Polytechnique, Institut Polytechnique de Paris/Sorbonne Université), which is world-renowned for its work in this field. COMHET will continue and strengthen this collaboration and will embark on crucial new fundamental research to exploit the potential of plasma technologies and their applications in space. The laboratory's work will focus on three areas related to the physical characteristics of Hall-effect thrusters and the specific associated scientific and technological issues:

- Focus area 1 – Study of alternative propellants.
- Focus area 2 – Digital simulation.
- Focus area 3 – Smart diagnostics.

The objective is to improve thruster performance and reliability, especially in terms of stability and compatibility, by developing innovative technological building blocks to meet the challenges around future satellite thrusters. The COMHET teams will explore the use of a new propellant such as iodine to replace xenon, which is expensive, as well as the use of digital simulation and the development of non-intrusive diagnostics to reduce the duration and number of vacuum chamber tests.

Compared with chemical propulsion, which generates immediate and powerful thrust, but uses a lot of energy, electric propulsion offers lower thrust, but it is continuous and much more fuel-efficient. This solution also offers significant weight savings and makes it possible to launch spacecraft that are lighter and/or have greater payload capacity.

Safran Electronics & Defense, through its Safran Spacecraft Propulsion subsidiary, a pioneer in electric motors for satellites in Europe, is developing Hall-effect thrusters in France. HET thrusters use an electric and magnetic field to create a plasma from a gaseous propellant. Plasma ions are accelerated by the electric field and expelled to create thrust. Fundamental research into plasmas and their applications in space propulsion is also being conducted by laboratories at CNRS and the École Polytechnique.

The French Defense Innovation Agency (AID, part of the French Ministry of the Armed Forces) is supporting COMHET by subsidizing the ValidHETion project through the CIEDS Interdisciplinary Research Center for Defense and Security. This collaborative project is part of the joint laboratory's focus areas 1 and 2, with the aim of validating digital tools by comparing them with measurements from experimental thrusters.

"After Xlim, COMHET is the second joint laboratory we've set up," says Jean-Marie Bétermier, Space Director for Safran Electronics & Defense. "These partnerships with the academic community give us greater control over the sovereign technologies we develop."

"CNRS is proud to be helping set up the COMHET joint laboratory," says Jean-Luc Moullet, Deputy CEO for Innovation, CNRS. "This partnership will provide a structured, long-term framework for collaboration on the design of future space thrusters. It also strengthens our solid and prolific ties with Safran, a long-standing partner of CNRS. We created our first joint laboratory with Safran over 30 years ago."

"We're delighted with this new collaboration with Safran Spacecraft Propulsion and CNRS, which will further strengthen the already well-established influence and excellence of the research by our Plasma

Physics Laboratory in the space sector," says Laura Chaubard, Director General and acting President of École Polytechnique. "By helping create the COMHET joint laboratory, which will also benefit from AID's support, École Polytechnique is reaffirming its mission to contribute to France's scientific and technological sovereignty."

Safran *is an international high-technology group operating in the aviation (propulsion, equipment and interiors), defense and space markets. Its core purpose is to contribute to a safer, more sustainable world, where air transport is more environmentally friendly, comfortable and accessible. Safran has a global presence, with 83,000 employees and sales of 19.0 billion euros in 2022, and holds, alone or in partnership, world or regional leadership positions in its core markets. Safran is listed on the Euronext Paris stock exchange and is part of the CAC 40 and Euro Stoxx 50 indices.*

Safran Electronics & Defense *is an international company with 10,000 employees, built on proven expertise in technologies that underpin sovereignty. By combining human and artificial intelligence, the company develops the products and services that empower aerospace and defense players to observe, decide and guide. Safran Electronics & Defense also supports fellow Safran companies by sharing its state-of-the-art electronics skills and expertise.*

The ***French National Center for Scientific Research*** *is one of the most recognised and renowned public research institutions in the world. For more than 80 years, it has continued to attract talent at the highest level and to nurture multi-disciplinary and interdisciplinary research projects at the national, European and international levels. Geared towards the public interest, it contributes to the scientific, economic, social and cultural progress of France. The CNRS is above all 33,000 women and men, more than 1,000 laboratories in partnership with universities and other higher education institutions bringing together more than 120,000 employees and 200 professions that advance knowledge by exploring the living world, matter, the Universe, and the functioning of human societies. The CNRS ensures that this mission is carried out in compliance with ethical rules and with a commitment to professional equality. The close relationship it establishes between its research missions and the transfer of acquired knowledge to the public makes it today a key player in innovation in France and around the world. Partnerships with companies are at the heart of its technology transfer policy, and the start-ups that have emerged from CNRS laboratories bear witness to the economic potential of its research. The CNRS provides also access to research findings and data, and this sharing of knowledge targets many audiences: scientific communities, the media, decision-makers, economic players and the general public.*

École Polytechnique*, also known as L'X, is the leading French institution combining top-level research, academics, and innovation at the cutting-edge of science and technology. Its various undergraduate and graduate-level programs – Bachelor of Science, Ingénieur Polytechnicien (Master's level program), Master's, and PhD – are highly selective and promote a culture of excellence with a strong emphasis on science, anchored in humanist traditions. As a widely internationalized university, École polytechnique offers a variety of international programs and attracts a growing number of foreign students and researchers from around the globe (currently 41% of students and 40% of faculty members). École polytechnique offers an exceptional education to prepare bright men and women to excel in top-level key positions and lead complex and innovative projects which meet the challenges of 21st century society, all while maintaining a keen sense of their civil and social responsibilities. With its 23 laboratories, 22 of which are joint research units with the French National Center for Scientific Research (CNRS), École polytechnique Research Center explores the frontiers of interdisciplinary knowledge to provide major contributions to science, technology, and society. École polytechnique is a founding member of Institut Polytechnique de Paris*

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