

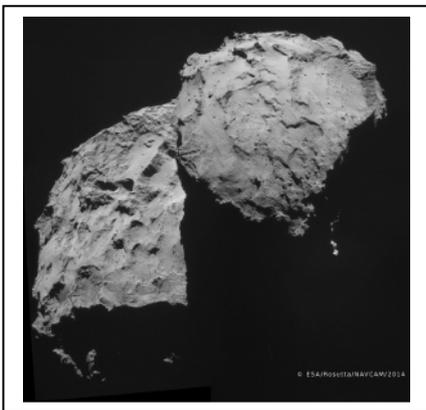
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France at the heart of the Rosetta space mission: a unique technological challenge

The Rosetta probe, an international European Space Agency (ESA) mission, is preparing to reveal the mystery of the evolution of the solar system, through analysis of comet 67P/Churyumov-Gerasimenko, a ball of ice measuring 4 km in diameter. France has been very closely involved in this project from the outset, via the French Space Agency (CNES), and represents the main contributor, alongside Germany, for a total cost of almost €1.3 billion. Thanks to its extensive cooperation with all global space powers, CNES plays a decisive role in economic diplomacy.

For the very first time, a space probe will accompany a comet for over a year, right up to the point on its orbit that is closest to the Sun, and most importantly, it will try, before mid-November 2014, to land a robot named Philae. The lander Philae will specifically target Site J, on the “head” of comet 67P/Churyumov-Gerasimenko, which was named after the Ukrainian scientists who discovered it in 1969.



Rosetta is an international mission run by the European Space Agency (ESA) and receives significant support from France.

According to Jean-Yves Le Gall, President of CNES, “*Rosetta is the major space event of 2014... CNES, which has been involved in this mission from the outset, is now keeping a close eye on Philae from the Toulouse Space Centre and preparing for its touchdown on the comet nucleus at the end of the year.*” CNES is the public body responsible for proposing French space policy to the Government and implementing this policy within Europe.

CNES expertise has been mobilized at all stages of the project, with regard to not only French scientists and industrial players, but also its international partners. It has contributed to all phases, from the preliminary studies to the operations, including by providing high-performance instruments and components for both the orbiter and the lander.

The Rosetta mission involves 300 scientists throughout Europe, including many French teams. Rosetta, which is entirely solar-powered, has flown over the Earth three times and Mars once, travelling a total of more than 6.5 billion kilometres since its launch from Kourou (Guiana) in 2004 on an Ariane 5 rocket.

Once it has deployed the lander Philae (which weighs 100 kg) to the comet nucleus, the orbiter Rosetta, the flagship of the mission, will continue its study of the comet until at least December 2015. “*By staying in close proximity to a comet over a long period, it is possible to examine changes in its*



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activity and its development as it moves towards and then away from the Sun”, explains Francis Rocard, head of the Rosetta programme at CNES.

This spatial archaeology mission was named after the Rosetta Stone, which enabled French scholar Champollion to decipher Egyptian hieroglyphics in the early 19th century.

France, via CNES, is the primary contributor to the Rosetta mission, alongside Germany. For example, France has helped to provide eight of the eleven scientific instruments on the orbiter. As regards the lander Philae, CNES has the major responsibility of running the Science Operations and Navigation Centre. It also provided primary and back-up batteries that could withstand almost ten years in space at an average temperature of -40°C. CNES is also responsible for coordinating the development of France’s contribution to scientific experiments carried out by the laboratories of CNRS-INSU (French National Centre for Scientific Research – National Institute for Earth Sciences and Astronomy), the Paris Observatory and Université Toulouse III – Paul Sabatier.

The excellence of the French space industry is boosting the development of national and international industry. Electric propulsion satellites are among the 34 projects selected by the French Government for *“The New Face of Industry in France”*.^{*} According to CNES, *“at €30 annually per capita, France devotes the second largest annual budget per capita to civil space activities, after the United States”*. CNES spends 80% of its budget through French companies and 40% of European space industry is based in France. The space industry accounts for 16,000 jobs in France, as well as 9,000 direct and indirect jobs in Guiana. Overall, with €20 of economic repercussions for every €1 invested, space innovation has a powerful impact on industry, the economy, research and public policies.

With regard to the great space powers (United States, India, China, Japan), CNES is developing many cooperation projects which bring it into contact with world experts in this field and enable it to participate in projects with very high added value, such as exploration of Mars with Mars 2020, supplying the International Space Station (ISS) with ATV Georges Lemaître, and observation of gamma-ray bursts (GRBs) with the SVOM mission. Yves Le Gall concludes, *“We are present on all fronts and we are racking up successes... We are determined to pursue this path, because now more than ever, CNES wants to continue driving innovation and to see science furthering innovation”*.

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Websites:

www.cnes.fr : French Space Agency (CNES)

www.esa.int : European Space Agency (ESA)

^{*} Presented by the President of the French Republic on 12 September 2013, *“The New Face of Industry in France”* is a programme to support 34 promising sectors with high potential for growth and innovation. From drones for thermal renovation of buildings to *“smart fabrics”* and digital hospitals, each sector received its own road map listing the public and private action to be taken, the respective roles of the various stakeholders, the financial, regulatory and technological levers to be activated and the goals to be achieved.

NB: The claims and opinions contained in this article, which aims to provide information on contemporary France, have no official value.