

Press release

Philae Lander Sees Comet through Swiss Eyes

Neuchâtel, 12 November 2014 – First-ever High-definition Miniaturized Cameras Were Developed in Neuchâtel for Instrument CIVA of Philae Comet Lander to take First Panoramic and 3-D Shots of Comet Landscape.

As the Rosetta spacecraft's Philae lander touches down today on its target, it will send the first ever images of a comet's nuclei from ground level. Conceived to function under extreme conditions, seven cameras will together take 360° panoramic pictures of the comet's surface that scientists, astrophysics enthusiasts, science lovers, and the world media will pore over in the coming days. Developed between 1998 and 2001, based on a prototype developed between 1992 and 1997 for the ESA Technology Research Programme, these high-definition cameras are not only miniature, they are robust enough to resist the violent vibrations of take-off and the extremely low temperatures encountered during the journey, and to follow a comet hurtling through space toward the sun.

The cameras compose part of CIVA (Comet nucleus Infrared and Visible Analyzer), one of ten on-board instruments for Philae's in situ analysis of the comet. When the prototype was first developed—well before the omnipresence of small digital cameras on each mobile phone—space-quality cameras were almost the size of the lander itself. *"It was a gargantuan feat to build something so small, and many thought it was impossible. Luckily the watchmaking and microtechnical expertise found in Switzerland was up to the challenge,"* explains CSEM researcher Ivar Kjelberg.

Weighing 100 grams each, able to take high-definition black and white images, use very little energy, and able to resist incredibly low temperatures of -150° C, these miniature cameras fit in the palm of one's hand—a world first for space travel that could be seen as the inspiration for the generation of terrestrial cameras we all have in our pockets today. There are seven identical visible spectrum cameras on the lander: five to take single images and one pair for a stereoscopic, or 3-D, view of the comet's landscape. And each camera is a jewel of engineering prowess: a complex system comprising highly miniaturized electronics, state-of-the-art miniature optics, signal conditioning and processing as well as a data communication interface and a customized mechanical interface.

The French-made, three-dimensional, stackable electronics allowed for considerable size reduction, while the optics, the mechanics, software and communication module are Swiss, customized to bear the punishing conditions of space travel. CSEM was prime contractor and among many other innovations for the project, notably developed the flexure-based assembly; a single piece of titanium with an internal spring that is machined into the structure, in a process known as Flextec, to assemble precisely the optics and the electronics and to allow for retraction and expansion during extreme heat fluctuations. Former project manager at CSEM for the ESA prototype camera and the CIVA cameras, Jean-Luc Josset, now director at the Space Exploration Institute (SPACE-X), explains: *"The development of this type of technology opens the doors for new, highly-demanding missions and is exemplary of the skills CSEM is able to offer."*

Background on the project

Rosetta is a European Space Agency (ESA) mission whose adventure began in March 2004 with the launch of the Rosetta comet chaser; ten years and more than six billion of kilometers later, touchdown is imminent. The CIVA instrument on the Philae lander is an *Institut d'Astrophysique Spatiale* (IAS) led project with development funding from the *Centre national d'études spatiales* (CNES). The testing and qualifications of the CIVA cameras were funded by ESA. CSEM would like to thank all of its international and regional partners in helping to make it possible to take the first ever close-ups of a comet and its landscape from its surface.



One of seven High-definition Miniaturized Cameras Developed for Instrument CIVA of Philae Comet Lander ©CSEM

Additional information

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About CSEM

CSEM – technologies that make the difference

CSEM, founded in 1984, is a private research and development center specializing in microtechnology, nanotechnology, microelectronics, system engineering, photovoltaics and communications technologies. Over 400 highly qualified and specialized employees from various scientific and technical disciplines work for CSEM in Neuchâtel, Zurich, Muttenz, Alpnach and Landquart.

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