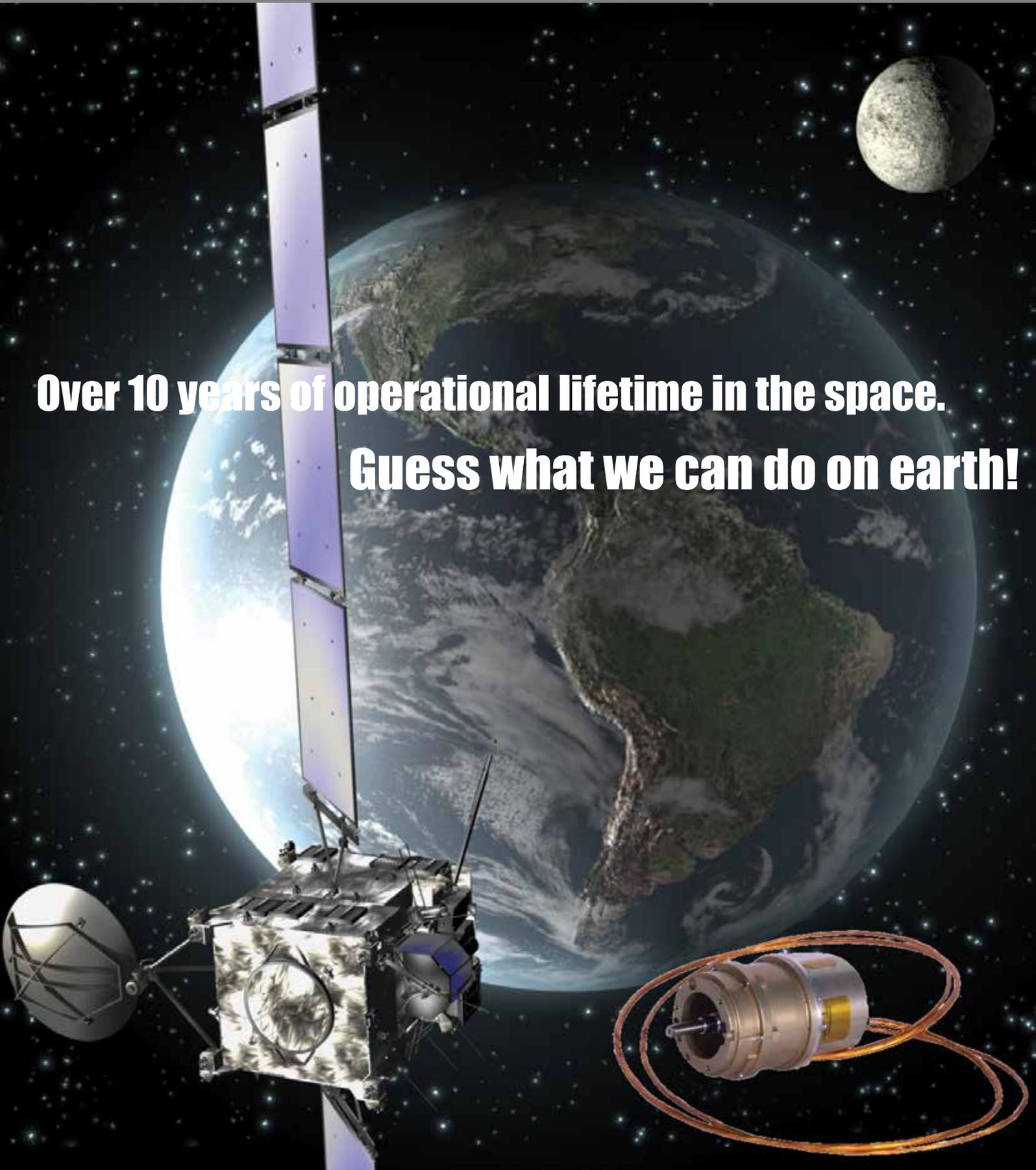


lika

Lika encoders &
the Rosetta Mission



**Over 10 years of operational lifetime in the space.
Guess what we can do on earth!**



#whereisrosetta #wakeuprosetta #likaspace #rosetta
@ESA_Rosetta @LikaElectronic

Lika Electronic, heading for space

ROSETTA pioneering spacecraft: a 10-year long story (and it's not all over!)

Rosetta is the ESA's (European Space Agency) scientific project involving a consortium of more than 50 contractors (private companies, institutes and universities) in Europe and the United States. **It is the first mission planned to orbit and land on a Comet.**

Rosetta probe (fig. 1) was launched by Ariane 5 spacecraft on 2nd March, 2004, from Europe's Spaceport in Kourou, French Guiana on an 10-year journey to the Comet 67P/Churyumov-Gerasimenko. It is designed to enter orbit around the Comet's nucleus in August 2014 after a series of gravity assist manoeuvres to gain enough orbital energy, with three swing-bys at Earth (March 2005, November 2007 and November 2009; see fig. 2) and one at Mars (February 2007). En route to the Comet, the star rover will flyby the asteroids Steins (September 2008) and 21 Lutetia (July 2010). Rosetta spacecraft carries eleven science instruments to probe the Comet's nucleus and map its surface in fine details.

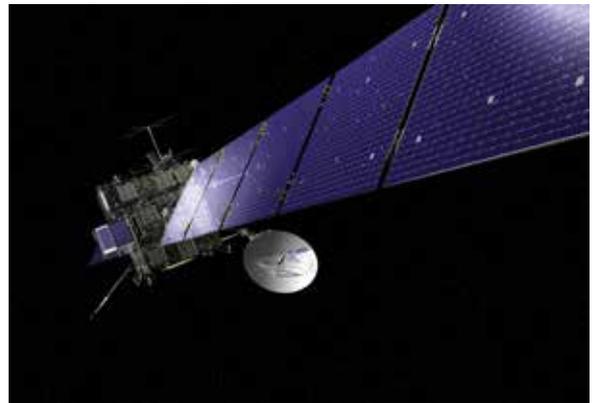


Fig. 1 - Rosetta image (courtesy of ESA J. Huart)



Fig. 2 - Earth's picture

After its closest approach to Earth, Rosetta looked back and took a number of pictures using the OSIRIS Narrow Angle Camera (NAC). Acquired on 15.11.2007 at 03:30 am CET
Image courtesy: ESA © 2005 MPS for OSIRIS Team

It will also land a package of instruments (the Philae Lander) to study some of the most primitive, unprocessed material in the Solar System. The mission will provide clues to the physical and chemical processes at work during the formation of planets, beginning 4.6 billion years ago. Among the instruments on board is the **OSIRIS**, the Optical, Spectroscopic and Infrared Remote Imaging System. OSIRIS is the eye and the imaging recorder of the Comet chaser throughout its long journey to the 67P Comet. It combines a **Wide Angle Camera (WAC)** and a **Narrow Angle Camera (NAC)** and is intended to capture high-resolution images of both the flight and the Comet's nucleus. Our cooperation with CISAS (Interdepartmental Centre for Studies and Space Activities) of the University of Padova has resulted in the development of an ultra-reliable and high-performance encoder for controlling the movement of the shutter motors in both WAC and NAC thermostated telescopes.

Thanks to this Lika Electronic has been **recognized as the first company** in Italy and the second in Europe to manufacture an encoder intended for space applications.

I38 space encoder



Fig. 3 - I38 Space encoder made of Titanium with Kapton cables. Brushless motor assembled on the front.

Fig. 4 - Assembly of the OSIRIS shutter system. The mechanism includes two shutters for exposure monitoring and protection of the cameras. Image courtesy of CISAS University of Padua.

Fig. 5 - Side view of OSIRIS mechanism. The encoder with integrated brushless motor is installed on the base plate and shows the shutter arm directly connected to the shaft. Opening and closing movement is carry out in less than 10 ms.

I38 SPACE incremental encoder is integrated into brushless motors mounted on the shutter mechanism of both the WAC and NAC cameras (fig. 4, 5). This very compact (Ø38 mm, 36 mm depth, 55 g weight) and very low power consumption (200 mW max.) optical encoder has a resolution of 14400 counts and an accuracy better than $\pm 10^\circ$ el. It is designed to control the sophisticated movement of the shutter and is capable of monitoring exposure times shorter than 10 msec. and ensuring a lifespan longer than 500,000 cycles at least.

Sure enough, malfunctions are not acceptable throughout the very long mission (over 12 years).

Furthermore it is expected to operate at extreme conditions of low temperatures and outer space vacuum.

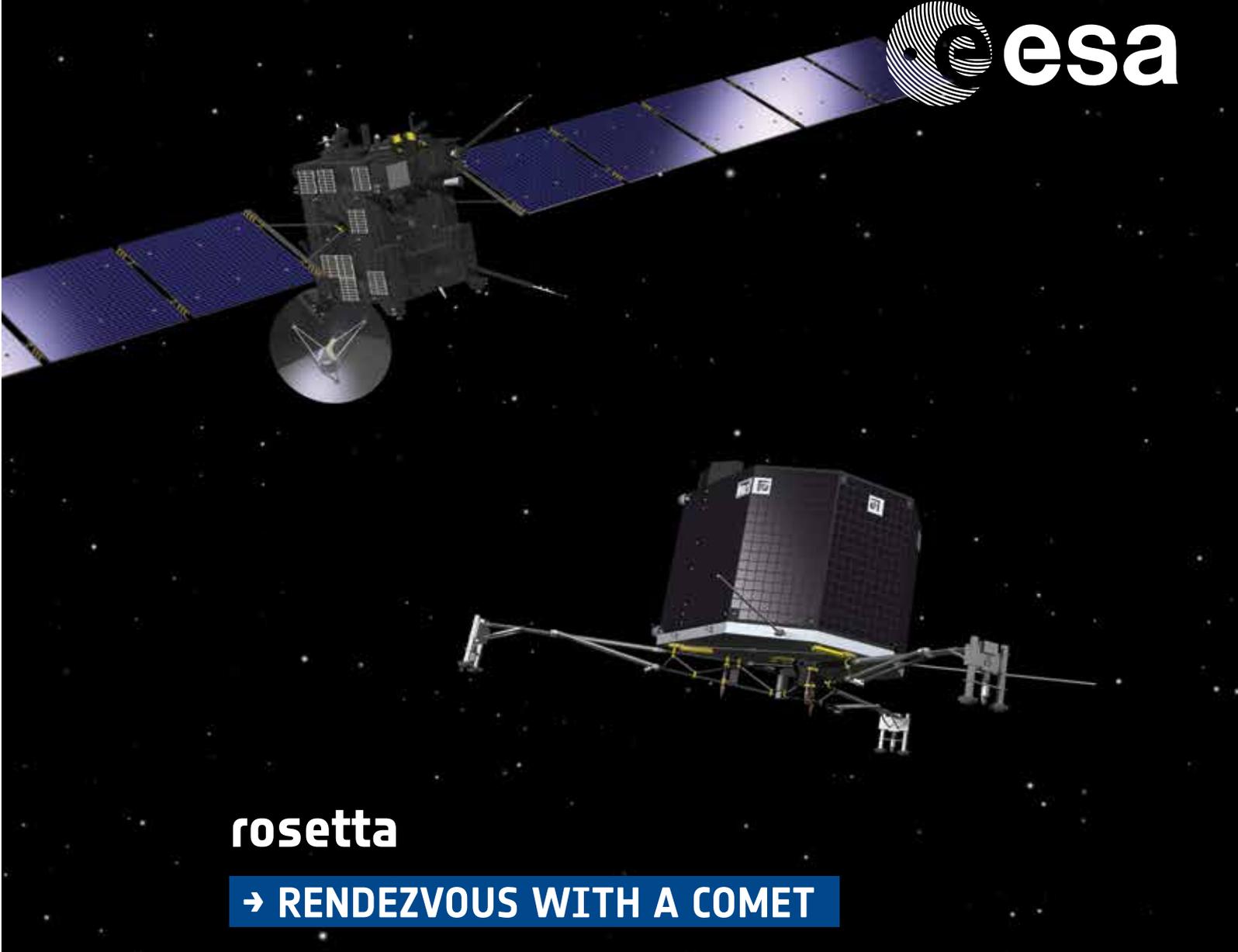
Because of the wide temperature fluctuations and radiations, selected components have been fitted without using any glue. Besides technical success, also costs were a key factor: as CISAS states "Lika's encoders proved to be about 5 times more cost effective than similar high-tech space encoders from specialist competitors". This project means a great deal to Lika Electronic, to its new daily experiences and the future endeavours and can positively vouch for the technical competence and the high-tech ingenuity of a forward thinking innovative and global company.



Fig. 4 - Top view



Fig. 5 - Side view



rosetta

→ RENDEZVOUS WITH A COMET

2 March 2004

ESA Rosetta launch from Kourou, French Guiana.
18 minutes later Rosetta was released into space

25 February 2007

Mars flyby. OSIRIS "camera" equipped with Lika encoders takes spectacular images of the planet

8 June 2011

All electronics were switched off for 31 month long hibernation

20 January 2014

Rosetta wake-up. Exit deep-space hibernation

May-July 2014

Deep-space rendezvous manoeuvres & start of close comet observation

August-September 2014

Rendezvous with Comet 67/P Churyumov-Gerasimenko
Start of close surface mapping with OSIRIS WAC-NAC camera

November 2014

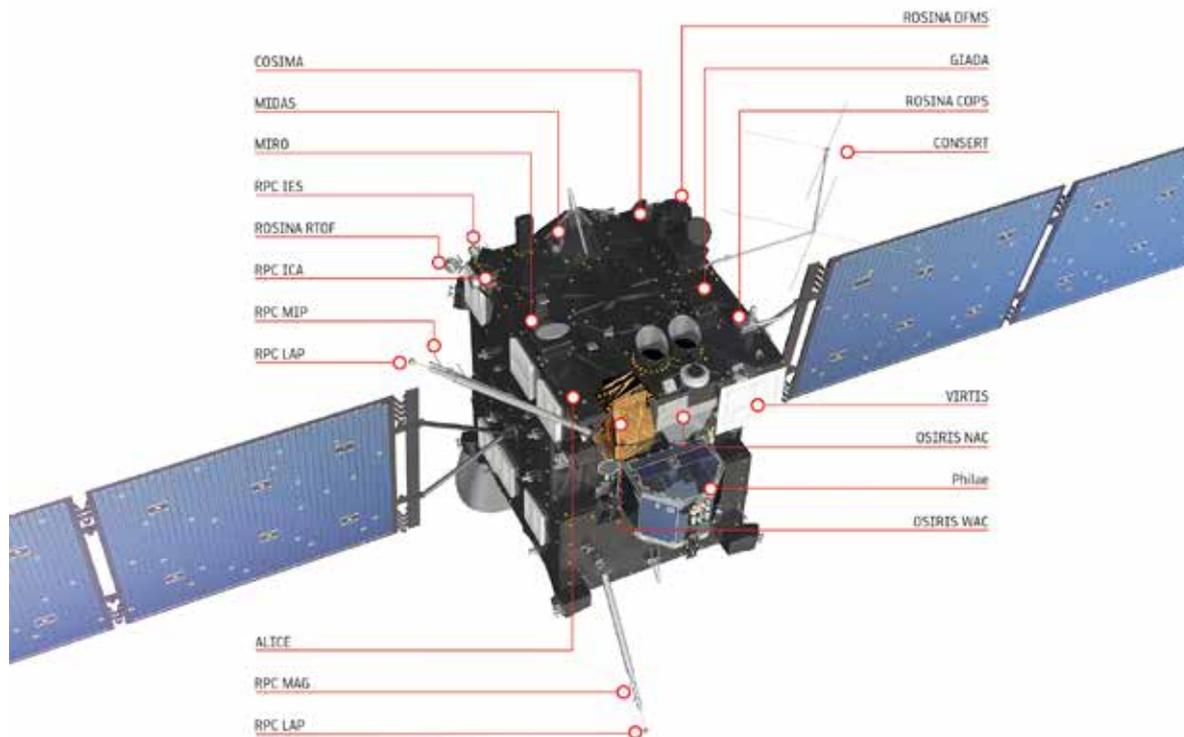
Lander will arrive on the surface of the Comet after a journey of over 800 Mio. km

December 2014

Monitoring of Comet's activity and evolution

August 2015

Closest approach to the Sun



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