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# Comet landing to test European tech

**Space watchers** are expecting high drama when a European Space Agency lander, called Philae, separates from the Rosetta orbiter in November and attempts to become the first spacecraft to make a controlled landing on a comet. The 100-kilogram lander was designed to operate autonomously — the only intervention from Earth will be the command to detach Philae from the orbiter. If all goes according to plan, it will land softly, settle into a stable position and transmit scientific data, possibly for years.

“The main challenge for the Rosetta lander is that we have had to design it without having any good information about the target body,” says Stephan Ulamec of the German Aerospace Center, who is project manager for the lander.

“Mass, shape, even the day/night cycle were unclear in the design phase of the lander,” he says. “The properties of the surface are still unknown, since one cannot easily derive surface strength from orbiter data. The strategy to cope with this situation was to

define an engineering model containing wide ranges of parameters — including some educated guesses — and tests were then performed against these model parameters.”

The target is comet 67P/Churyumov-Gerasimenko, which was attractive because it passes through the inner solar system between the orbits of Earth and Jupiter on its 6.5-year orbit around the sun. The Rosetta spacecraft has been closing in on the comet since its launch in 2004.

Philae will extend its three landing legs and touch down on the surface at the speed of a meter per second. The self-adjusting landing gear is designed to ensure that the lander can

operate from a level or sloping surface. On touchdown the lander will fire two harpoons into the surface to anchor the lander in place and a cold gas thruster on top of the craft will push Philae gently down on to the surface. Gravitational forces on the comet are so weak there is a danger the lander will tip over or bounce off the surface immediately after landing. Landing legs are equipped with screws under the footpad to fix them in place.

Philae carries nine scientific instruments, including a drill that will reach about 20 centimeters beneath the surface to extract material for examination by the lander’s onboard lab. An antenna will transmit data to Earth via the orbiter and it will take 30 minutes for messages to be received.

Analyzing what lies below the surface could help scientists determine whether comets aided development of life on Earth by delivering water and organic compounds.

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The Philae lander, shown in an artist's rendering, is expected to transmit a wealth of data to researchers after it lands on comet 67P/Churyumov-Gerasimenko next month.