Proba-3 complete: Formation-flying satellites fully integrated and ready for testing

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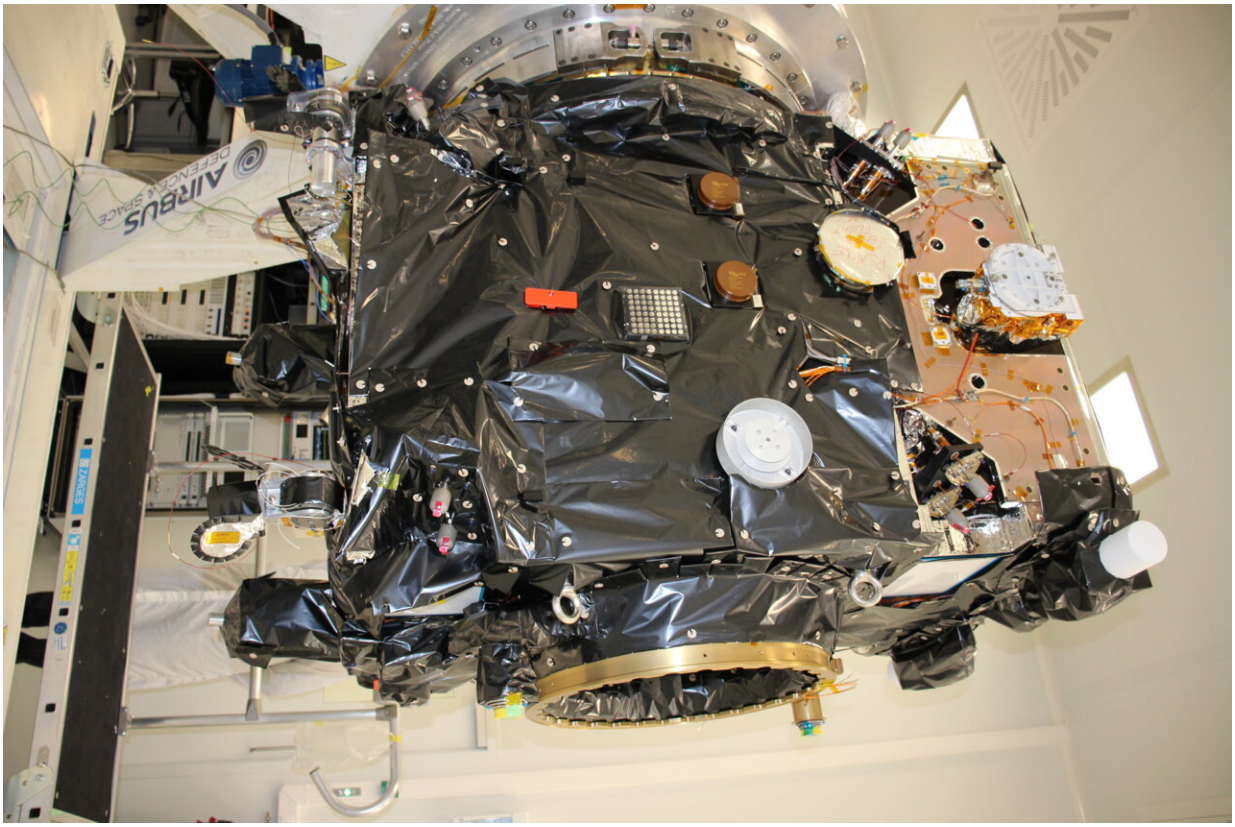

Proba-3 Coronagraph seen after integration at Redwire in in Kruibeke, Belgium. This satellite will observe the solar corona with its APIICS coronagraph instrument (seen top), made possible by the Proba-3 Occulter spacecraft that flies in formation with it blocking out the blinding solar disk for up to six hours at a time. Credit: ESA

The two spacecraft forming ESA's Proba-3 mission for precise formation flying in orbit are now complete. All the instruments and sensors allowing them to maneuver to millimeter scale precision relative to one another have been integrated aboard, and the pair are fully wrapped in multi-layer insulation—ready to be tested in simulated space conditions.

The pair are currently facing each other across a cleanroom belonging to Redwire Space (formerly QinetiQ Space) in Kruibeke, Belgium, in the same configuration they will adopt in orbit.

To mark the occasion of their integration, the Proba-3 project invited members of ESA's Belgian and Spanish delegations to visit the facility.

ESA's Proba-3 mission manager Damien Galano explains, "Proba-3 has contributions from across Europe, but its main coronagraph instrument comes from Belgium's Center Spatial de Liège, CSL, and its satellites have been integrated here at Redwire Space. The satellite platforms meanwhile were designed by Airbus Defense and Space in Spain while Spain's SENER company serves as prime contractor. So these two countries are very much in the lead for the mission, and this visit gave a chance for their delegations to see this milestone for themselves."

Also present were representatives from the Proba-3 science team and ESA's Science Directorate. While Proba-3 is a technology-testing mission, its main payload is a science instrument focused on the sun which will produce unique data.

Proba-3 fact sheet. Credit: European Space Agency

During the observation phase of their orbits, the pair will form a straight line in space with the sun exactly 144 m from each other so that the "Occulter" spacecraft—equipped with a round disk—will cast a shadow onto the second "Coronagraph" spacecraft.

By doing so the Occulter will block out the brilliant solar disk to allow the Coronagraph to image the wispy outer atmosphere of the sun, known as its corona, for up to six hours at a time.

On Earth the corona is visible only for a few moments during rare solar eclipses, but the availability of sustained observation should address many mysteries of the solar corona—including why it is a million degrees C hotter than the surface of the sun that it radiates from.

Jorg Versluys, payload system engineer, adds, "Ground and space observatories often incorporate sun-blocking coronagraphs—the ESA-NASA SOHO spacecraft is one famous example—but their effectiveness is limited by light spilling around disk edges, a phenomenon called diffraction. By hosting our coronagraph on a separate spacecraft we reduce diffraction and increase overall visibility of the sun's surroundings. And looking closely at the Occulter's edge shows that it has been precisely curved to reduce diffraction effects still further."

Sustained observations will only be made possible by the spacecraft entering formation for a prolonged period of time, enabled in turn by an onboard suite of guidance and control methods, including satellite navigation receivers, radio inter-satellite links, lasers and optical cameras.

Damien notes, "The latter will be guided by light emitting displays placed on the face of both spacecraft for the other to see. In fact one of the reasons the spacecraft's multi-layer insulation is black is to ensure maximum contrast with the onboard LEDs so the cameras can observe them clearly."

The satellite pair will fly on a highly elongated (or "elliptical") 19 and a half hour orbit that will see them venture a maximum 60,530 km away

from Earth—performing observations at the top of each orbit to minimize gravitational and illumination effects from our planet. For the rest of their orbit they will be free flying with respect to each other.

Next month the spacecraft will be shipped to IABG in Germany for the start of a four-month environmental test campaign, simulating every aspect of the launch and space environments. Proba-3 is due to be flown by PSLV launcher from India next year.

Provided by European Space Agency