



SOLAR ORBITER

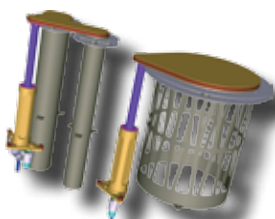
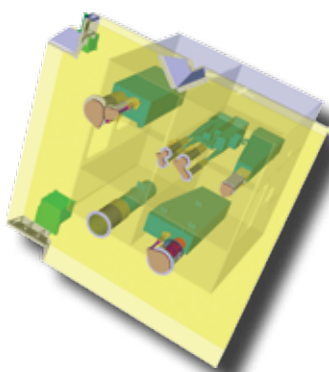
The Sun is the ultimate source of virtually all the energy on Earth; it is the dynamo that drives the weather, and its energy directly or indirectly fuels almost every living thing on our planet. Furthermore, virtually all the energy we use to sustain our complex society has its origins in the sun's rays hitting the Earth's surface. Because of its fundamental importance to our existence, the Sun is a critically important subject for scientific study.

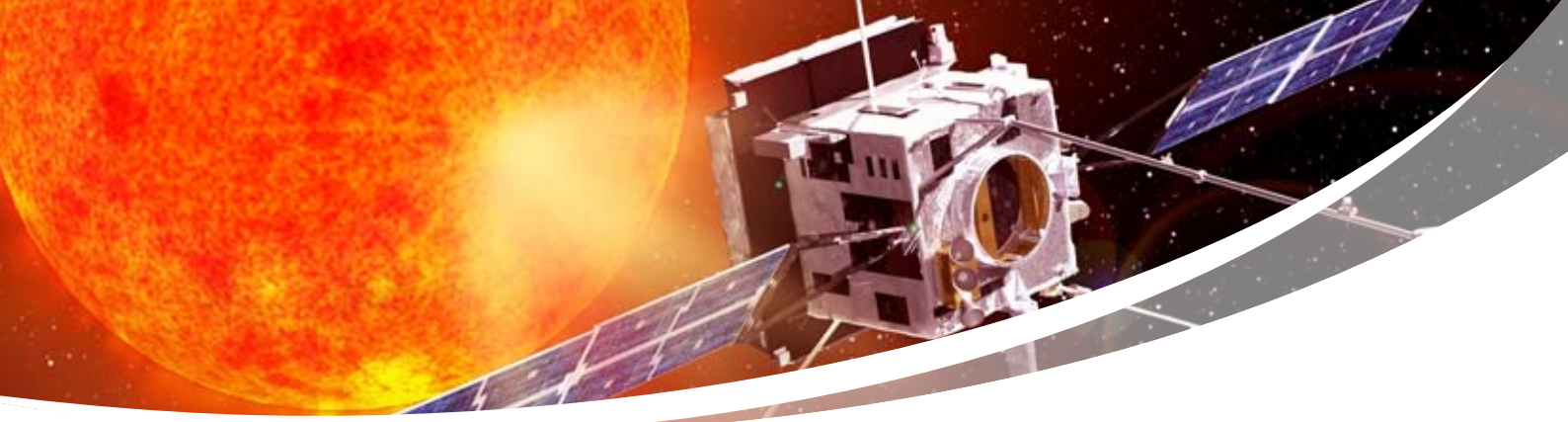
Solar Orbiter, a candidate M-class mission in ESA's Cosmic Vision programme to be carried out in collaboration with NASA and primed by Astrium UK, has the objective of sending a spacecraft to monitor and observe the sun, using a suite of advanced scientific instruments and at a proximity never before achieved.

The Solar Orbiter mission will take the next step in observation of the Sun from space. The selected mission profile and instrumentation package aim at enabling, for the first time, the following achievements:

- Exploration of the uncharted innermost regions of the solar system;
- Observation of the Sun from close-up (48 solar radii or ~ 0.235 AU), with the perihelion distance allowing extended observation of the Solar surface through an orbital angular velocity quasi-synchronous with the angular velocity of the Sun;
- Imaging of the Sun's polar regions from heliographic latitudes in excess of 25° (34° in the Extended Mission Phase).

In doing so, scientists hope to learn more about our home star and usher in the next era in solar science.





Customer	European Space Agency	
Mission	Solar Orbiter will, through a novel orbital design and an advanced suite of scientific instruments, provide the observations required to take Solar Science to the next level. Launch date is 2017	
Orbit	<ul style="list-style-type: none"> Perihelion between 0.22 AU and 0.25 AU, for at least 3 consecutive orbits. Aphelion between 0.8 AU and 0.9 AU. Period about 150 days Co-rotation pass: duration 10 days, with a maximum drift of 50°. Inclination evolving from 0° to 27° (with respect to solar equator), 34° in the extended mission 	
Payload	Remote sensing instruments package: <ul style="list-style-type: none"> Polarimetric and Helioseismic Imager (PHI) Coronagraph (METIS) Spectral Imaging of the Coronal Environment (SPICE) Extreme Ultraviolet Imager (EUI) Spectrometer/Telescope for imaging X-rays (STIX) Heliospheric imager (SoloHI) 	In-situ instruments package: <ul style="list-style-type: none"> Solar Wind Analyser (SWA) Radio & Plasma Wave Analyser (RPW) Magnetometer (MAG) Energetic Particle Detector (EPD)
Features	<ul style="list-style-type: none"> Heat shield to protect the spacecraft from Sun light (heat flux at perihelion 28kW/m²) Feedthroughs to provide Field-Of-View to the Remote Sensing instruments through the Heat Shield Double sided Solar Array. High Temperature High Gain Antenna (HGA) and Medium Gain Antenna (MGA) to communicate with Earth at a distance above ~0.28 AU from the Sun. The technology is under development for Bepi Colombo Deployable boom to carry several of the in-situ instruments that require a magnetically clean environment or wide fields of view Chemical propulsion system to provide orbital and attitude control 	
Mission Duration	Cruise Phase: Zero deterministic delta V trajectory of duration ~3.5 years Science Phase: Nominal mission duration: 3 years Extended mission Phase: 3 years in addition to the Nominal mission	
Astrium Responsibilities	<ul style="list-style-type: none"> Prime contractor & System engineering Payloads Management Thermal & Mechanical design Feedthroughs, doors and mechanisms design Propulsion design 	<ul style="list-style-type: none"> Mission analysis AOCS and FDIR design Electrical architecture & OBDH design System AIV definition
TAS-I Turin Responsibilities	<ul style="list-style-type: none"> Heat Shield design Power & TT&C design 	

Key Features:

The main technical driver is the punishing thermal flux that the spacecraft will experience, peaking at ~20 solar constants.

The Heat Shield is composed of a separate highly-insulating layer, held above a support structure by brackets. The Heat Shield relies on being able to reject heat to cold space via the gap between the layers. Also included are feedthroughs, doors and mechanisms which provide the required fields of view for the Remote-Sensing Instruments.

The solar arrays are 2-sided in order to produce adequate power over the wide range of sun distances. Far from the sun the 'cold' face is fully exposed to the Sun; as the spacecraft comes closer to the Sun, the arrays are flipped over to expose the 'hot' face of the array. As the distance to the Sun decreases further, the solar arrays are progressively tilted in order to reduce the effective area exposed to the Sun, hence limiting their temperature.

During close approach to the sun, the High Gain Antenna must be folded behind the shadow of the Heat Shield to protect it from the intense solar flux. During these periods the spacecraft will be operating autonomously.

INDUSTRIAL TEAM



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TAS-I Turin



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