Case Study for SPAN Website

Solar Orbiter

Since the beginning of the 1990's nine spacecraft with major contributions from the UK science community for the Ulysses, SOHO, Stereo, Hinode and Cluster missions have been investigating the Sun and its impact on our planet. With Solar Orbiter, we will take a close approach to find out ever more about our nearest star. Solar Orbiter is a mission dedicated to solar and heliospheric physics. It will launch in Feb 2020 from Cape Canaveral in Florida.

The mission will provide close-up and high-latitude observations of the Sun. Solar Orbiter will have a highly elliptic orbit – just 0.28AU (inside the orbit of Mercury) at perihelion. It will reach its operational orbit just under two years after launch by using gravity assist manoeuvres (GAMs) at Earth and Venus. Subsequent GAMs at Venus will increase its inclination to the solar equator over time, reaching up to 24° at the end of the nominal mission (approximately 7 years after launch) and up to 33° in the extended mission phase.

Being close to the Sun allows for observations of solar surface features and their connection to the heliosphere for much longer periods than from near-Earth vantage points. The view of the solar poles will help us to understand how dynamo processes generate the Sun's magnetic field. The mission will provide underpinning science that will enable better understanding and modelling of the Sun's activity which is of vital importance for the forecasting of Space Weather.

Solar Orbiter is an ESA-led mission with contributions (including the launch and one science instrument) from NASA. Eight of the instruments are provided by nationally funded, PI-led, consortia (with 2 of these led by the UK and contributions to a further instrument). The final instrument is provided by a UK-led team funded by a combination of a direct ESA contract and nationally funded contributions. The mission has its origins in discussions instigated by the UK science community in the late 1990's; the UK team were instrumental in the mission being proposed, refined and developed to the stage where it was selected by ESA as the first medium class mission in the Cosmic Vision program in 2011.

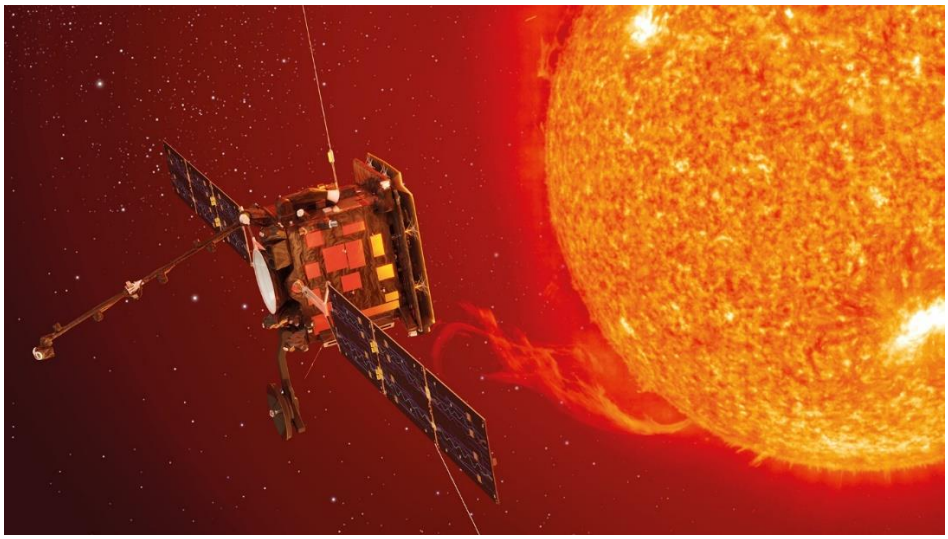
The Solar Orbiter spacecraft is developed and led by Airbus in Stevenage under a contract to ESA. This ~£280M Prime contract covers the development of the whole of the space segment of the mission (excluding the instruments) and has supported hundreds of jobs in the UK (both at Airbus and throughout the supply chain) over the past 10 years.

This mission (along with SOHO and Stereo) provide the technical background and heritage which is now being deployed in the preparation for the L5 Lagrange Space Weather operational mission which is under study by ESA. Because living near a star is risky business, this mission will position a spacecraft near the Sun to observe rapidly changing solar activity and deliver early warning of possibly harmful space weather. Many aspects of the payload design and spacecraft concept which will be used in this mission trace back to the Solar science missions of the past, including Solar Orbiter.

On most days, our normally calm Sun goes about its business, delivering a steady and predictable amount of heat and light that keeps planet Earth and its humans ticking. But just as the Sun drives weather on Earth, solar activity is responsible for disturbances in our space environment, 'space weather'. Besides emitting a continuous stream of electrically charged atomic particles, the Sun periodically sneezes out billions of tonnes of material threaded with magnetic fields in colossal-scale 'coronal mass ejections'.

These immense clouds of matter usually miss Earth, but if one reaches us it can disrupt Earth's protective magnetic bubble and upper atmosphere, affecting satellites in orbit, navigation, terrestrial power grids, and data and communication networks, among other effects. Obtaining warnings of such events would be immensely helpful: a recent ESA study estimated the potential impact in Europe from a single, extreme space weather event could be about €15 billion. Without the past investment in Solar science missions, such an operational mission to mitigate for these risks would not be feasible.

Images:



Artists Impression of Solar Orbiter spacecraft observing the sun from 0.28AU.

Credit: ESA

The Solar Orbiter spacecraft at the premises of prime contractor Airbus Defence and Space in Stevenage, UK.

Credit: Airbus Defence and Space