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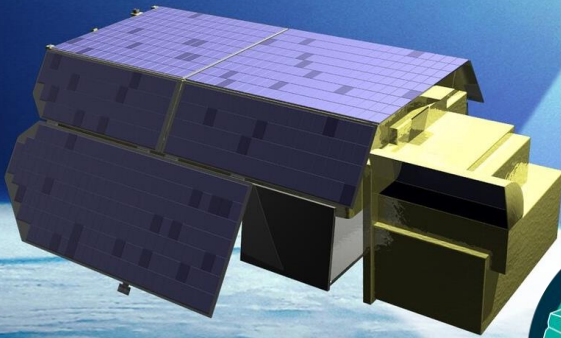


Image credit: ESA



# TRUTHS: Traceable Radiometry Underpinning Terrestrial- and Helio-Studies Satellite

The TRUTHS mission is currently in development by ESA, on behalf of the UK Space Agency and other partner nations across Europe. TRUTHS will be a calibration laboratory in space, increasing the accuracy of Earth Observation data by up to ten times. It will provide a benchmark reference of the 'optical' radiation state of the planet from which change can be detected in as short a time as possible.

## Opportunities the TRUTHS mission will offer

TRUTHS will provide high-accuracy hyperspectral measurements of solar radiation incident on and reflected by the Earth, allowing changes and causes in the Earth's energy imbalance to be observed faster than ever before, and helping to constrain uncertainties on future climate projections, boosting confidence in data used for climate decision-making. It will also help to assess efforts to mitigate carbon emissions and the impact of these strategies on our environment.

TRUTHS will establish a 'gold standard' reference dataset to cross-calibrate other sensors. This will reduce the uncertainty on measurements from all Earth Observation satellites, increasing interoperability and their utility.

TRUTHS will reduce the cost of future satellite missions, as there will be no need for each mission to have its own on-board calibration system.

## Mission Partners

- [European Space Agency \(ESA\)](#)

## UK Expertise

- The UK has provided 85% of the funding for the mission through ESA. The remainder comes from Switzerland, Greece, the Czech Republic, Romania and Spain.
- The UK's [National Physical Laboratory \(NPL\)](#) conceived the mission; [Airbus Defence and Space \(UK\)](#) are the prime contractor; [CGI UK](#) have helped define the Payload Data Ground System to monitor the satellite; [Telespazio UK](#) have supported the Ground Segment study team, defining requirements for the mission; [Teledyne e2v](#), located in Chelmsford, UK, will supply the detector for the 'camera'; and [Goonhilly Earth Station](#) has supported initiatives on skills and capability development and outreach.
- Others involved: the [National Centre for Earth Observation \(NCEO\)](#), [RAL Space](#), [University of Leicester](#), [Thales Alenia Space](#), [Surrey Satellite Technology Ltd](#), [AVS](#), [GMV](#) and an increasing number of others as we move towards implementation.

*"This climate mission puts the UK at the forefront of space-based Earth Observation, it will become the 'gold standard' for EO data which will underpin global climate information services going into the future"*  
 – Prof Nigel Fox, Chief Scientist for Earth Observation and Climate, National Physical Laboratory (NPL) and Space4Climate Board Member

## Mission Timeline

### Early 2000s

Scientists at the UK's National Physical Laboratory (NPL) conceive the TRUTHS mission concept.

### Nov 2019

TRUTHS is adopted as an ESA mission.

### July 2022

TRUTHS passes the preliminary design phase, passing technical and scientific reviews.

### Nov 2022

The TRUTHS mission secures further funding at the ESA ministerial conference.

### Dec 2023

ESA sign contract with Airbus & Teledyne e2v for satellite design & instruments

### 2030

Estimated launch date for TRUTHS on the Vega-C rocket from Kourou, French Guinea.

## Instrumentation

- The TRUTHS satellite will be launched into a polar, non-Sun-synchronous orbit at an altitude of ~610km. TRUTHS will measure the whole Earth: land, ocean, ice and atmosphere, visiting each area of sunlit Earth approximately monthly with some regions like the poles, every few days.
- TRUTHS will have two main instruments:
  - The Hyperspectral Imaging Spectrometer (HIS) will measure radiation in narrow spectral bands continuously at all wavelengths from ultraviolet to infrared (320-2400nm) and with a spatial resolution on the Earth of 50m. It will also observe the Sun and Moon.
  - The Cryogenic Solar Absolute Radiometer (CSAR) will measure total incoming solar energy and serve as the on-board 'gold standard'.
- TRUTHS will also have an onboard calibration system (OBCS), which will use sunlight split into different wavelengths by a monochromator. to provide a calibration link to the HIS from the CSAR – the process and reference standard mimicking that used on the ground at NPL laboratories in Teddington.

## Further Information

- Airbus, Nov 2020: [Airbus wind European Space Agency TRUTHS...](#)
- CGI, Apr 2021: [CGI supports European Space Agency TRUTHS...](#)
- NPL, accessed May 2023: [TRUTHS mission development](#)
- Teledyne, Dec 2020: [Teledyne e2v to supply Infrared detector for...](#)
- Telespazio UK, accessed May 2023: [TRUTHS Mission](#)
- UK Space Agency, May 2019: [UK-led mission to improve...](#)
- UK Space Agency, Apr 2021: [Case study TRUTHS](#)
- [Centre for Earth Observation Instrumentation](#)
- ESA, accessed May 2023: [TRUTHS](#)
- ESA, Dec 2024: [Contract secures next step...](#)
- Goonhilly, accessed May 2023: [TRUTHS](#)
- NPL Royal Institution lecture, March 2024, ['Unleashing the power of satellites for climate action'](#).



Watch the TRUTHS video



"TRUTHS is a highly innovative mission that promises to be extremely useful to the climate science community with its unprecedented radiometric accuracy and uncertainty traceability"

– Prof Helen Brindley, Imperial College London



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