The UK's Space Science and Exploration Programme in 2010

Update – 20th September 2010

The UK Space Agency is taking over responsibility for the majority of the UK's long-standing commitment to space science and exploration. Scientific discovery is one of the Agency's prime responsibilities and the Agency team have long term experience in managing scientific programmes. The technology for space science and exploration missions challenges our industry and laboratories to develop new technology, develop new skills in their workforce, and create spin-off applications here on Earth.

This article provides more information on how things are being organised and which missions the UK is involved in.

What do you mean by space science and exploration?

Space science is the foundation of the UK's activities in space, and there are a number of types of science carried out with the aid of space missions. The UK is very strongly involved in 'outwards-looking' missions whose goals are to answer questions about the origin, history of the Universe. These questions are tackled using an array of spacecraft which include astrophysics missions (e.g. space-telescopes such as Herschel), observatories looking at our Sun (e.g. STEREO) and its relation with the Earth (e.g. Cluster); and probes which visit moons, planets, comets and asteroids (e.g. Venus Express and Rosetta). The technology required includes advanced detectors, propulsion, software, and operations – and the UK space sector is skilled in all of these areas.

These projects are either carried out through the Science Programme of the European Space Agency (ESA), or through bilateral collaboration with other space agencies such as NASA. In fact, almost everything we do is international. By pooling our financial resources with other countries, we ensure that the UK is involved in world-class projects of a quality, scale and range beyond the means of any one country.

Space exploration means discovery by directly visiting locations and includes both robotic and human missions. Since 2005, the UK has been involved in Mars exploration through an optional programme of the European Space Agency. However, no firm plans to visit other planets with astronauts currently exist anywhere. The European Mars exploration programme has now been expanded to become a long-term collaboration with NASA.

There is another important class of scientific missions concerned with looking down toward the Earth rather than out to the stars, and trying to better understand our own planet from space. Examples of spacecraft involved in this work include Envisat, GOCE and Cryosat-2. The UK's programme in this area has been managed by the Natural Environment Research Council (NERC), but it is also transferring to the UK Space Agency. More information on this programme will be provided in a later article.

The UK does not presently have a funded programme of microgravity science - scientific studies that exploit the low-gravity environment of space. The British National Space Centre (BNSC), the predecessor organisation to the UK Space Agency, carried out a consultation on UK interest in microgravity science in 2009 and once the Agency is running as a full executive (from April 2011), it will evaluate what next steps to make in this area.

What will be the UK Space Agency's responsibilities regarding space science and exploration?

Until recently, the UK's space science programme was managed by the Science and Technology Facilities Council (STFC), one of the UK's Research Councils. As part of the transition process, the responsibilities for funding of the ESA space science programme; national space science projects including instruments for ESA missions; and the support to operation of space science missions actually in orbit are all moving to the UK Space Agency. However, the Agency will continue to work closely with STFC after the transition is complete, as STFC will retain the lead on funding the research work carried out by universities using the data generated by the missions – the so-called 'scientific exploitation'.

How will the UK Space Agency work with STFC and how does it get external advice on priorities for the scientific programme?

The UK Space Agency (formerly known as BNSC) and STFC had a history of working closely together; in fact, STFC seconded several staff to work in BNSC. Both STFC and BNSC managed the space science and space exploration with support from experts in universities and industry programme via two committees – the Space Science Advisory Committee (now the Scientific Programme Advisory Committee or SPAC) and the Aurora Advisory Committee (AurAC).

The SPAC's terms of reference have been updated to reflect an increased responsibility – to provide the agency with advice on priorities for funding new projects as part of a peer review process. This means that the Agency does not allocate funds without taking expert advice from the scientific and industrial community involved.

STFC also has a vital role in this peer-review process, to ensure that the right science is carried out and that funding to exploit missions funded by the UK Space Agency is available to researchers. The new arrangements for handling funding applications to the Space Agency and STFC are being worked out and some information has been already announced.

More data about SPAC and its membership can be obtained from Rosemary Young and about AurAC from Sue Horne.

Which space science missions is the UK Space Agency already involved in?

The UK is involved in a comprehensive set of operational space science and exploration missions via bilateral cooperation or through funding of ESA. These spacecraft have all been launched and are successfully delivering data, some for many years. These are:

- Swift
- Hinode
- STEREO
- Hubble Space Telescope

- Cluster
- SOHO
- Cassini
- XMM-Newton
- Integral
- Rosetta
- Mars Express
- Venus Express
- Herschel
- Planck

More information on all these missions is available on the UK Space Agency web site via the 'Missions' section of the website.

What new projects are being built at the moment?

In accordance with the civil space strategy, and thanks to careful preparation by STFC over several years, the UK is investing in a set of new space science and exploration instrument projects which are being built. All these projects were selected following a rigorous process of competition and peer-review at both European and national levels – only the highest quality proposals survive the competitive process. More information on these projects is available on the Agency web site.

The missions are (with their planned launch dates in brackets):

- A £4.8M contribution towards the LISA Test Package for the ESA/NASA LISA Pathfinder gravitational wave test mission (2012);
- A £10M contribution to the Data Analysis and Processing Consortium for the ESA GAIA astrometry mission (2012);
- A £5.2M contribution to the MIXS X-ray spectrometer for the ESA BepiColombo mission to Mercury (2013);
- A £19.3M contribution towards the Mid IR Instrument for the NASA/ESA/CSA James Webb Space Telescope (2014).

In addition, £10.5M funding for the development of a group of instruments for the ExoMars rover (2018 launch) was announced by UKSA in June 2010. These are the Pancam, the Life Marker Chip, the X-ray diffractometer and the Raman spectrometer.

These projects are managed by the UK Space Agency team based at the Agency HQ in Swindon. It is important to understand that UK Space Agency funding to ESA provides the cost of building, launching and operating the spacecraft, while national funding is needed to build and operate the individual instruments aboard the spacecraft and for scientists to use the results.

Financial information on UK contributions to ESA may be found in the Agency's annual report, available in the 'Publications' section of UK Space Agency's web site. The UK is presently the second largest funder of the ESA space science programme (after Germany) and also of ExoMars (after Italy).

What missions are planned for the future?

To keep the UK in the forefront of space science, we are part of ESA's long term space science planning project, called *Cosmic Vision*. This is looking at providing funding for missions that will be launched in the 2017-2020 period and beyond. Following a peer-review selection process involving STFC and the Agency's Science Programme Advisory Committee, £4.5M of preparatory funding was announced by the UK Space Agency in July 2010. The candidate missions are the Euclid dark-energy mission, the Plato planet search telescope and Solar Orbiter in the 'Medium-size' class; and the Jupiter Ganymede Orbiter, the gravitational wave observatory named 'LISA'; and the International X-ray Mission (IXO) in the 'Large-size' class.

Funding to support mission and technology work for the next Mars robotic mission after ExoMars will flow back to UK industry and scientists via the Agency's funding of the ESA MREP (Mars Robotic Exploration Preparatory) Programme, for which the UK is the largest funder (25%). The UK's strategy post-ExoMars has been developed and published by the Agency's Aurora Advisory Committee (AurAC) in 2009 and is focused on preparing for the first international Mars Sample Return mission (MSR). MSR will be an international mission to be undertaken in the 2020s and will bring carefully selected samples of material back from Mars for the first time, so that scientists can examine them using the most advanced laboratory techniques.

How is the UK Space Agency involved in international discussions about space science and exploration?

The UK Space Agency is involved in collaborative European projects as well as with other space organisations around the world.

The Agency provides the UK's delegates to the governing Council of ESA; its Science Programme Committee; and the Programme Board for Human Spaceflight, Microgravity and Exploration. The UK continues to be an active participant in the International Space Exploration Coordination Group which has just published the first international architecture for lunar exploration and is starting work on a global exploration mission roadmap.

The UK Space Agency is the current Chair of the International Mars Exploration Working Group, which hosts discussions between space agencies on coordinating their Mars exploration plans.

The UK Space Agency funds the Rutherford Appleton Laboratory to represent the UK at COSPAR (the international Committee on Space Research), which holds major international conferences on space science.

The UK Space Agency also represents the UK in discussions with the European Commission regarding space science and space exploration. Through its Framework ('FP7') programme, the commission is providing some funding support to basic space science and technology work – see the relevant pages on the Agency web site for more information on FP7.

Following the signature of a Statement of Intent between the UK Space Agency and NASA, a range of science and exploration related technologies have been identified to be of mutual interest and detailed discussions on how the two agencies might collaborate will begin in the autumn.

What will be the future funding of space science and exploration in the UK?

Priorities and funding of current and future projects by the UK Space Agency will depend on the outcome of the Spending Review later this year as this will provide the Agency with its budget from April 2011 onwards.