

*The Ophir Chasma, a northern part of the Valles Marineris canyon, as viewed by the High Resolution Stereo Camera (HRSC) on ESA's Mars Express. The image was taken during orbit 334 in April 2004 with a ground resolution of approximately 36 m per pixel. ESA/DLR/FU Berlin (G. Neukum)*

# UK stakes claim on future Mars missions

by Clive Simpson

## PPARC pledges £5 million to ESA space exploration programme

The UK space community received a huge boost at the beginning of October when Science Minister Lord Sainsbury confirmed the UK's commitment to the next stage of a European space exploration programme 'Aurora'. The Particle Physics and Astronomy Research Council (PPARC) will invest £5 million over the next year and a half on behalf of the UK in the European Space Agency's (ESA) preparatory phase for Aurora.

Aurora is the framework proposed by ESA for the long-term exploration of the solar system, with the ultimate aim of a human mission to Mars in 2033. Its two main themes are the development of human technologies to eventually take humans to Mars, and the robotic exploration of Mars as a precursor to a human mission.

The UK investment, along with subscriptions from other member states, will enable ESA to define a roadmap for Aurora, begin preparations for the first robotic missions, and produce costed proposals to see the first missions through to launch.

The information gained from the preparatory phase will enable all member states to decide what role they wish to take in the final, implementation stage for Aurora.

For the UK, the main science interests in Aurora are to study the possibility of extraterrestrial biology, giving us insight into our own biology, to better understand the

formation and evolution of solar system and to understand our own planet better

The science discoveries and technology developments are intended to put Europe in a position in a decade or so to decide whether to establish a human presence on Mars.

Earlier this year, ESA proposed to member delegations a 'Preparatory Space Exploration Programme – Aurora' which would have two goals. First, to refine the overall programme roadmap and, second, to begin preparation of the early robotic missions where the scientific and technological goals are well defined.

After a meeting of the Aurora Board of Participants in July 2004 (at which the UK is represented by PPARC) a programme of work was agreed and a declaration opened for individual member nations to subscribe to this preparatory or 'interim' programme. The open period for this declaration closed on 30 September 2004.

This interim programme will undertake a range of activities to be let via competitive tender to academia and industry and to be completed by 2006. The output will be a costed definition both for the overall programme and for the first scientifically oriented robotic missions.

Lord Sainsbury, speaking at a press conference in London on 1 October, featuring leading members of the science and industrial community, said: "The first discoveries of ESA's Mars Express have shown again the value of investing in space science. It is a

fantastic European success story of which we can all be proud.

"I also believe that our involvement in such high-profile space science missions has the power to inspire young people to pursue their interests in science. Governments and space agencies have a unique opportunity to show that science and engineering are both important and also exciting subjects."

Lord Sainsbury said the UK focus was very much on exploiting robotic technology and said the great advances made in this field offered a cost-effective way of expanding knowledge of our own solar system and universe.

"Missions such as Mars Express, Venus Express and Rosetta are part of a series of top quality ESA missions using robotic technology. They offer by far the greatest scientific value relative to investment," he claimed.

When ESA originally proposed Aurora in 2001 the UK invested about £1 million along with other European countries in order to define the objectives of a planetary exploration programme focussed on Mars as the key objective.

"I have been impressed that both UK scientists and industry have been very successful in getting involved in this definition process, not least thanks to the know-how gained through the Beagle 2 project," Lord Sainsbury stated.

He admitted, however, that Aurora presented a challenge to UK space policy because it could involve both human and

robotic exploration.

In July of this year, ESA proposed to continue the definition of the programme up to the next ESA Ministerial-level Council meeting which is expected to take place in late 2005 or 2006.

In order to maintain progress, this required an additional subscription of funds from member nations and a total of 40 million Euros (over £25 million) was requested by ESA.

"Fortunately, here in the UK, we had anticipated this request," said Lord Sainsbury. "In the spring of this year PPARC started a consultation process with UK scientists and industry, seeking to establish the goals of Aurora – what would be the importance of the science, how well-positioned is UK industry to play a leading role and how interesting is the new technology needed by Aurora to the wider economy?"

To answer these questions, dozens of scientists and engineers met in several open workshops, debating the issues and presenting a wider public case. Lord Sainsbury said a review by PPARC's independent Science Committee at the end of September had concluded that the potential scientific return from the robotic exploration aspects of Aurora were important enough to place the initiative high on its list of future priorities.

"As well as the science benefits, we also think that such a programme could develop valuable new technology in autonomous robotics, in failure safe software, and in miniature 'lab on a chip' diagnostic instruments," he added.

Lord Sainsbury said the ancient history of Mars is still shrouded in mystery and independent reviews have repeatedly identified that a robotic Mars Sample Return mission could unlock many of the key secrets, as well as offering the opportunity to discover evidence of past or present life on the red planet.



UK industry and science representatives at the Aurora press conference in London. Pictured (from left) are: Dr Mike Healy (EADS Astrium), Dr Sarah Dunkin (Rutherford Appleton Laboratory), Lord Sainsbury and Prof Ian Halliday (PPARC). C.Simpson

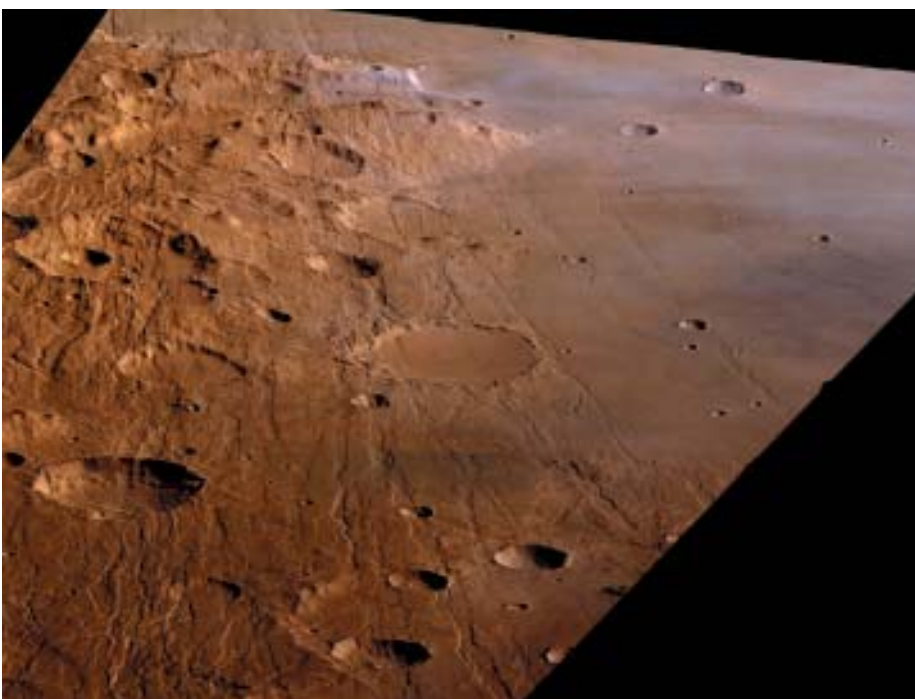
"However, such a mission requires technology we do not have and skills yet to be mastered. We need to land a probe that can drill below the surface; we need to place those samples in a biologically sealed container; and then we need to launch the container from the surface of the planet, rendezvous in-orbit and finally fly the precious cargo hundreds of millions of kilometres back to Earth," he explained.

"None of this is easy, so we must proceed one step at a time and as part of an international effort. First, we must show that we can land safely with a small probe; then we

must explore Mars with robotic vehicles; and finally we must find just the right spot to land our interplanetary geologist. Each milestone in this journey will reveal more about the environment of Mars and whether life could or ever did exist there."

Lord Sainsbury added: "Doing all of this will stretch the imagination of the whole country. Better still, it could inspire a new generation of young people to see science and technology as something both exciting and also as a first-rate career choice. The British have always been explorers, so maybe we can re-ignite our spirit of adventure along the way, too."

He said the £5 million investment would make the UK one of the leading contributors to



Europe's Mars Express captured this perspective view during orbit 508 on 13 June 2004. It has a ground resolution of approximately 40 metres per pixel and the displayed region is the eastern part of Claritas Fossae and the western part of Solis Planum at longitude 260 E and latitude of about 28 S. The diffuse blue-white streaks in the northern parts of the scene are clouds or aerosols. This region is characterised by systems of 'grabens' running mainly north-west to south-east. These can be traced several hundred kilometres up to the northern Tharsis shield volcanoes.

ESA/DLR/FU Berlin (G. Neukum)

this next phase up to early 2006 which would determine whether the goals are both achievable and affordable.

"We have clear scientific targets for our space programme and over this next, critical period, I want British scientists and industry to work closely with ESA so that the Aurora programme is realistic and focuses on the key scientific issues.

"Space exploration has always been a voyage of discovery and today could be the start of another exciting journey which greatly expands our knowledge of the world in which we live."

Though the new money secures UK participation only in the planning phase of Aurora, officials said that the decision signalled a 'moral obligation' to spend the much greater sums that will be required once missions start.

This could see the UK contributing up to £25 million a year on Mars exploration although Pro Ian Halliday, chief executive of PPARC, said that the eventual figure could be half this.

Prof Halliday described the initial phases of Aurora as a structured approach to recover the ground lost with the failure of Beagle 2 at the beginning of the year.

"Over the next 18 months UK scientists and industry will have the opportunity to shape the



Artist's impression of the ExoMars rover with its exobiology payload. ESA

programme on European robotic exploration. It is good being clever, it is a lot better to be clever and to have some money behind you. That is how we are trying to position UK scientists," he said.

"This is a very good fit for UK science interests. The UK will be more effective in this programme in space than we have been for a long time. The UK is prepared to take a leadership role."

The Aurora programme is likely to start with a technology demonstration mission in 2007 which will test landing systems for the Martian surface. This will be followed in 2009 by


ExoMars, a rover that will explore the surface and attempt to seek out signs of past and present life.

Two years later, ESA could then be in a position to launch the first phase of a sample return mission that bring Martian rocks back to Earth for study and analysis.

Looking at Aurora from a UK industry perspective, Dr Mike Healy, UK Director of Earth Observation, Navigation and Science at EADS Astrium, said the decision recognised the importance and significance of Aurora as one of the most exciting initiatives for many years and identifies the expertise and experience already well established in the UK.

This will help to ensure that the UK remains at the heart of European Space activity. The UK is not only investing in the future of its space capability, but also in the employment and education of its scientists and engineers."

Dr Healy said the decision sent a very positive message to young people throughout the UK and would encourage more to pursue careers in science and engineering. "If we are able to fully participate in the implementation phase, the current generation of budding scientists and engineers should have something to aim for and an exciting programme of work over the next 30 years," he claimed.



### KENNEDY SPACE CENTER ASTRONAUT TRAINING EXPERIENCE (ATX)

A special invitation to Space flight enthusiasts to tour the world's busiest space launch facility and train for a simulation shuttle launch.

Travel arrangements include scheduled flights to Orlando from London, Birmingham, Manchester, Glasgow and Edinburgh (via New York). Rental car for 7 days (including unlimited mileage & 3rd party liability insurance cover) and 7 nights accommodation at the Cocoa Beach Oceanside Inn, on Florida's Space Coast, just 30 minutes from Kennedy Space Center and one hour from Orlando's theme parks and attractions. Plus, 7 days of unlimited admissions to Kennedy Space Center.

**Program Highlights**

**Astronaut Briefing:** Guests will get a briefing from a veteran NASA Astronaut. The Astronaut will share his/her experiences in space and prepare the group for the ATX experience. The briefing is concluded with an in-depth question and answer period where guest participation is encouraged. Due to the exclusive nature of the program (12 person teams) the experience is very personal and very frank in nature as in a gathering of colleagues.

**Guided Tour of Kennedy Space Center:** The 2-hour Guided tour includes an in-depth look at the world's busiest space launch facility. Guests will see historic landmarks, active facilities and hear entertaining stories from a trained space expert.

**Highlights of the tour include:**


- NASA Press Site - where media broadcast launch news around the globe. The stop showcases the official countdown clock that guests will recognise from T.V.
- Shuttle Landing Facility - where the space shuttle fleet touches down after a successful mission.
- Space Station Processing Facility - where guests will view real components of the International Space Station being tested and readied for launch.
- Launch Complex 39-A & B - where the space shuttle fleet is launched. This includes an incredibly close stop by the launch pads for a photo opportunity. Guests also stop at an amazing viewing site between the launch pads and the coastline.

**Training:** Numerous simulators put theory to the test as the group trains on the following:


- Multi Axis Trainer - tests the Astronaut Candidate's ability to deal with an out-of-control tumble in three axes of rotation.
- Zero G Wall - simulating the freedom of movement an Astronaut has in micro-gravity during a spacewalk.
- 1/6 Gravity Chair - simulating walking on the moon under one sixth the gravity that we know on earth.

**Space Shuttle Mission Simulation:** This complete mission simulation allows each of the 12 team members to take a role in the launch, operation and landing of a Space Shuttle flight. From Commander to Mission Specialist to Public Affairs Officer, this is the most realistic space shuttle simulation you've ever seen. Technology allows the simulation administrator to add anomalies for advanced groups assuring the mission will always be challenging. Participants are sure to walk away with a first hand experience in the massive responsibility of each of these jobs.

**Lunch:** The program includes an up-scale deli-style lunch. Participants will have a chance to socialise with their team leaders in an informal, privately catered set-up. Lunch is included at no additional charge.



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