Back to Mars for the closest look yet

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In two days' time [Wednesday 10th August] NASA will launch the biggest spacecraft ever to be sent to Mars - Mars Reconnaissance Orbiter (MRO). UK scientists are involved with MRO's Mars Climate Sounder instrument that will profile the atmosphere of Mars. Additionally, MRO carries high resolution cameras to provide the most detailed picture yet of the Red Planet's surface, including the potential to trace lost Mars missions such as the UK's Beagle 2.

Scheduled for launch from Cape Canaveral on Wednesday 10th August (12.54hrs. BST; 07.54hrs. EDT) the prime objective of the mission is to determine the history of water on Mars. A suite of instruments will zoom-in to capture extreme close-up images of the Martian surface, analyse minerals, look for subsurface water, trace how much dust and water are distributed in the atmosphere and monitor the daily global weather.

UK scientists from Oxford, Cardiff and Reading Universities are involved in the Mars Climate Sounder (MCS) instrument – essentially a weather satellite for Mars. It will profile the atmosphere of Mars detecting vertical variation in temperature, dust and water vapour concentration.

Professor Fred Taylor from Oxford University is a co-investigator on the Mars Climate Sounder instrument has high hopes for the instrument. "No previous mission to Mars has carried a dedicated atmospheric sounder, capable of obtaining global profiles of the key meteorological variables with complete coverage and high vertical resolution."

He adds, “We believe this will be the key to understanding the present climate regime on Mars much better. This in turn will be essential for future missions to the surface of the Red Planet - as payloads get larger, the atmospheric conditions for a successful landing become more critical. The Climate Sounder project will also lead to computer models of the Martian atmosphere of comparable complexity to those being used to study global warming on the Earth - an essential prerequisite to working backwards to understand why conditions on Mars changed so much, from warm and wet a billion years ago to the cold, dry desert we see today.”

With three state-of-the-art cameras onboard MRO will be able to take an unprecedented look at the surface of Mars – homing in like a microscope on specific features. The Hi-RISE camera will provide the most detailed pictures yet of the surface focusing on objects down to the size of a small table. This has raised the prospect that it could potentially look for signs of lost Mars missions, such as the UK built Beagle 2 Lander and NASA’s Mars Polar Lander.

Professor Colin Pillinger from the Open University, the Beagle 2 lead scientist, is optimistic about the possibility of tracing the Lander, which was last seen successfully spinning away from its mothership Mars Express in December 2003. Prof. Pillinger commented, “Rich Zurek, MRO’s project scientist, can both sympathise and empathise with the Beagle 2 team since he was project scientist for NASA’s Polar Lander mission which was also lost on Mars. He knows how much it would mean to us to find evidence of Beagle 2. If we could just see some trace of it on the surface then at least we could see how far it got – the not knowing is the worst bit! It will be a very difficult thing to do but this is our best chance of finding out what happened and we will be watching the progress of the mission with great interest and anticipation.”

Mars has been a prime focus for planetary exploration over the last

decade with 8 missions since 1996. Of these NASA's Mars Global Surveyor and Mars Odyssey, together with the European Space Agency's [ESA] Mars Express, continue to research the Red Planet from orbit, whilst NASA's Mars Exploration Rovers - Spirit and Opportunity – are still crawling over the Martian surface, far exceeding their original 3 month lifespan. Plans are already being developed for the next phase of Martian exploration involving more sophisticated missions including a Sample Return mission and the long-term prospect of sending humans to Mars. In Europe the proposed missions for ESA's Aurora programme of planetary exploration, again focused on Mars, will be decided at the ESA Council meeting at Ministerial level in December 2005.

Dr Andrew Coates from UCL's Mullard Space Science Laboratory, a co-investigator on the ASPERA instrument onboard ESA's Mars Express, explains how the work of NASA's MRO compliments that of Mars Express and, when combined, will pave the way for future exploration.

"Europe's Mars Express has made several staggering discoveries including evidence for water-ice in a polar crater on the Martian surface; signs of a frozen sea near the equator; and has found tantalising evidence for methane in the atmosphere, created either by volcanism or from life. The spacecraft is also searching for water up to 5km below the Martian surface and is studying the escape of the Martian atmosphere into space".

Dr. Coates added, "All this will be complimented by NASA's MRO which, having the capabilities of a weather satellite, will profile the Martian atmosphere at unprecedented levels. Plus MRO carries very high resolution cameras to provide unmatched images of the Martian surface. When combined with the data from Mars Express we will have an incredibly detailed picture of Mars, its atmosphere and surface, including ideal sites for future Landers. Additionally, MRO could provide a communications channel to Earth for future European robotic

surface missions like ExoMars - a key element of ESA's Aurora programme of robotic exploration in which the UK hopes to be intimately involved".