

Joint Mars plans come together

NASA and the European Space Agency (ESA) have unveiled a joint plan for exploring Mars in the latter half of the next decade. ESA will build a trace-gas orbiter, able to map plumes of methane in the atmosphere, for launch in 2016. This could help to target landing of the agency's flagship rover, ExoMars, and a mid-sized NASA rover, due for launch in 2018.

"These two rovers will be focused on astrobiology — seeking the signs of life," says NASA's Mars programme chief Doug McCuistion, who told the US Mars community about the plan at an advisory committee meeting on 29 July at Brown University in Providence, Rhode Island.

The plan was negotiated at a NASA-ESA summit in Plymouth, UK, at the end of June, and McCuistion says that ESA member states have now agreed to it. Jack Mustard, a Brown University geologist and chair of a NASA Mars advisory group, says that the community is pleased to have a 2016 orbital mission at all after the Mars Science Laboratory (MSL), a large rover still scheduled for a 2011 launch, ran roughshod over NASA budgets with its price tag, which could end up being as high as \$2.4 billion. "Scientists are definitely happy to have a viable opportunity for measurements," he says. "But it's far too new. No one knows what it means or how it's going to work out."

Each agency has negotiated its share of the work. NASA will provide Atlas rockets for both launches, and in 2018 it aims to re-use the 'sky crane' technology that it is developing to lower the MSL to the planet's surface. Initially, NASA and ESA officials

hoped to squeeze ExoMars and a trace-gas orbiter onto the same Atlas rocket for a 2016 launch. But ESA eventually agreed to delay ExoMars until 2018, a launch window with better orbital mechanics.

ESA plans to use leftover payload on the 2016 rocket for a small lander as a way to test tricky technology for entry, descent and landing. In 2018, NASA is looking to fit another rover on board. Whereas ExoMars will drill cores as much as two metres deep to look for life, the new NASA rover — bigger than the current rovers Spirit and Opportunity, but smaller than the MSL — would analyse and cache rocks as a first step in a far-off sample-return mission.

Both could be aided by the 2016 orbiter, if it were able to direct the rovers to a landing site near vents of methane, which can be produced by subterranean microbes or by hydrothermal processes on certain volcanic rocks. A paper in *Nature* this week (see page 720) shows that the observation of seasonal methane plumes cannot be explained by conventional models for atmospheric circulation, which should disperse the methane uniformly. The authors instead posit that seasonal plumes of methane can exist only if the gas is destroyed quickly in surface interactions with soils.

A joint NASA-ESA science team has just begun working out the orbiter's design requirements, with instruments expected to be awarded competitively to ESA or NASA scientists. Sushil Atreya, an atmospheric scientist at the University of Michigan in Ann Arbor who has worked on ESA's Mars Express orbital mission, says he is pleased to see initial designs calling for methane sensitivities of parts per trillion. That would be orders of magnitude better than the parts-per-billion measurements of Mars Express, and could allow the detection of light carbon isotopes — a possible indicator of biological origin — within methane molecules.

But mapping the methane will be much, much tougher, says Atreya. A spatial resolution of 10 or 20 kilometres would be necessary to be of any help in targeting a rover. Mars Express was only able to find hints of regional methane variability, whereas the plumes discovered by ground-based observations were discerned across hundreds of kilometres. "Have you ever tried to catch gas in the wind?" asks Mustard. "It's a moving target."

Eric Hand

