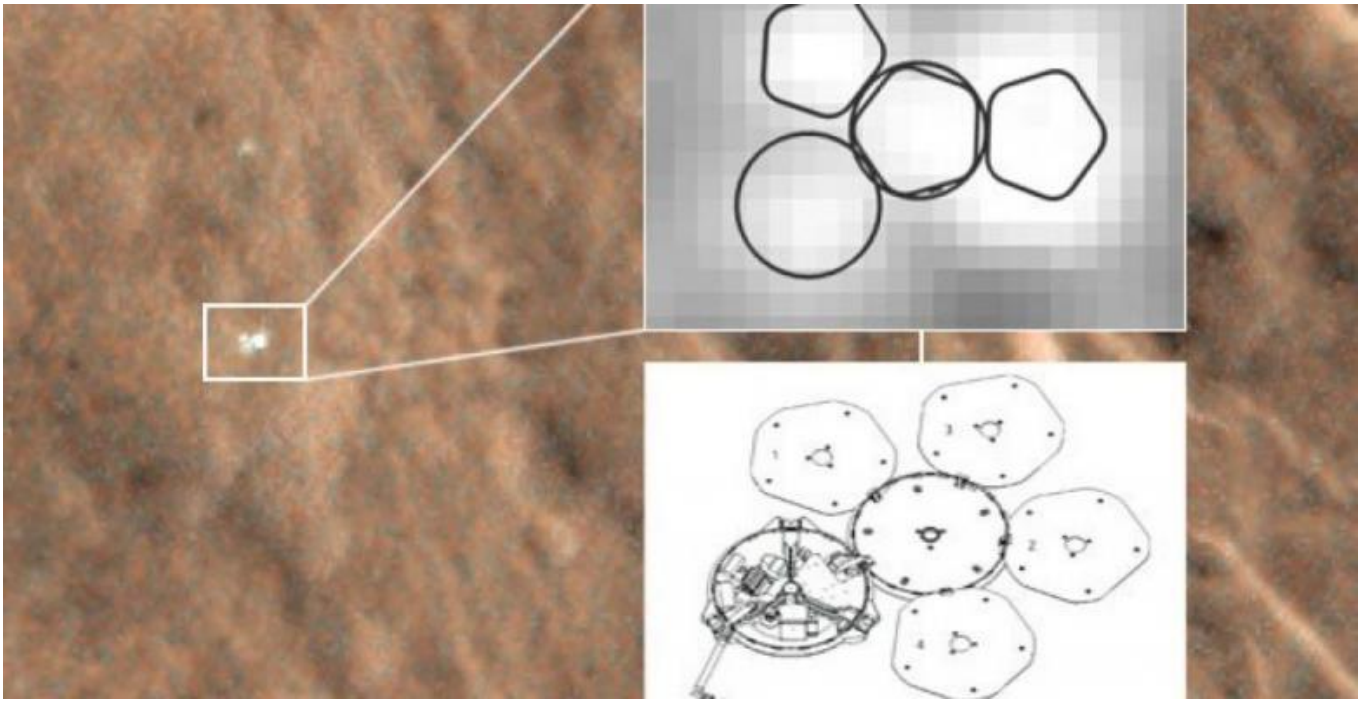
Lost Beagle2 probe found 'intact' on Mars

16/01/2015



High-resolution images taken from orbit have identified its landing location, and it looks to be in one piece.

The UK-led probe tried to make a soft touchdown on the dusty world on Christmas Day, 2003, using parachutes and airbags - but no radio contact was ever made with the probe.

Many scientists assumed it had been destroyed in a high-velocity impact.

The new pictures, acquired by Nasa's Mars Reconnaissance Orbiter, give the lie to that notion, and hint at what really happened to the European mission.

Beagle's design incorporated a series of deployable "petals", on which were mounted its solar panels.
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Dr Judith Pillinger Beagle2 team member

From the images, it seems that this system did not unfurl fully.

"Without full deployment, there is no way we could have communicated with it as the radio frequency antenna was under the solar panels," explained Prof Mark Sims, Beagle's mission manager from Leicester University.

"The failure cause is pure speculation, but it could have been, and probably was, down to sheer bad luck - a heavy bounce perhaps distorting the structure as clearances on solar panel deployment weren't big; or a punctured and slowly leaking airbag not separating sufficiently from the lander, causing a hang-up in deployment," he told BBC News.

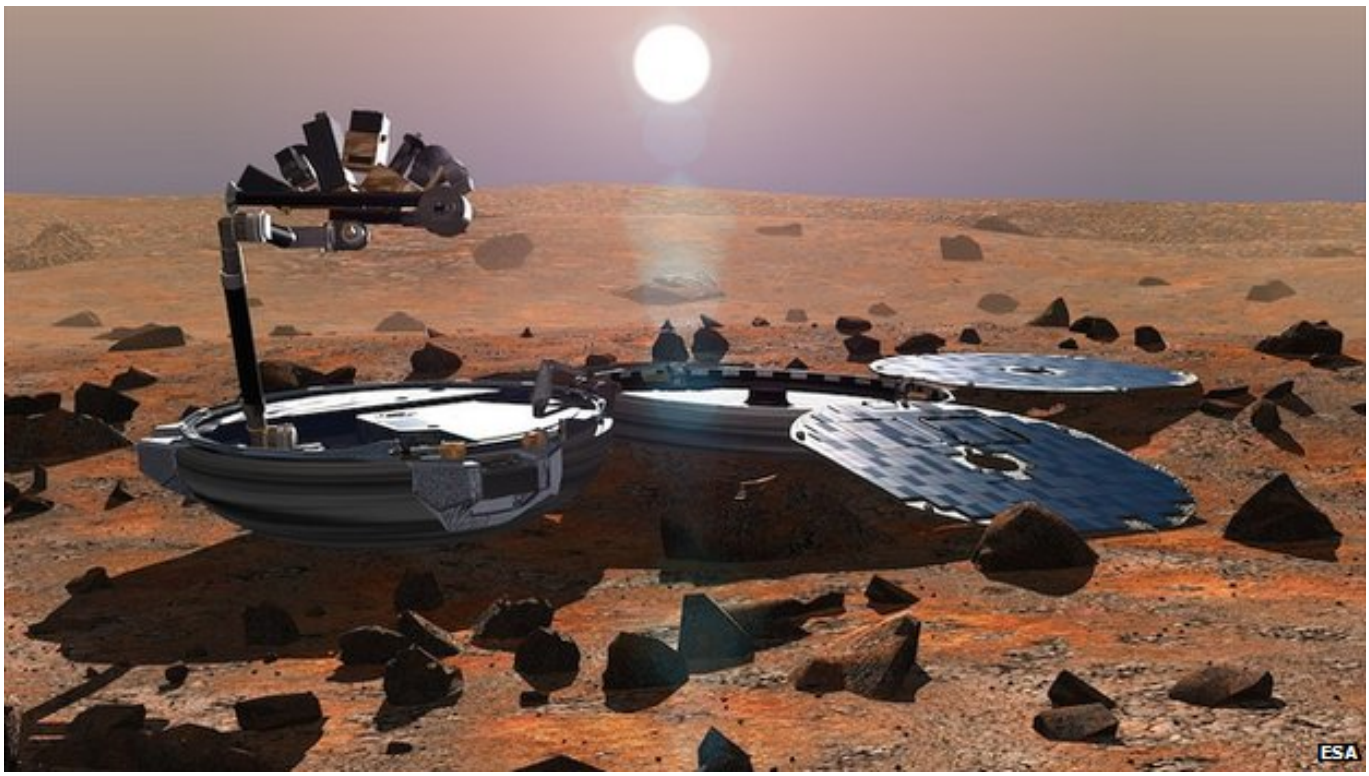
The discovery of Beagle comes less than a year after the death of the probe's principal investigator, Colin Pillinger. The Royal Society scientific institution announced an award in commemoration of Prof Pillinger on Friday.

The Open University scientist was the driving force behind the project, and although his mission never got to explore Mars, he is credited with sparking a huge enthusiasm among the public for space research.

His wife and fellow Beagle team-member, Dr Judith Pillinger, said: "Colin was always fond of a football analogy. No doubt he would have compared Beagle2 landing on Mars, but being unable to communicate, to having 'hit the crossbar' rather than missing the goal completely.

Beagle 3

"Beagle2 was born out of Colin's quest for scientific knowledge. Had he known the team came so close to scoring he would certainly have been campaigning to 'tap in the rebound' with Beagle3 and continue experiments to answer questions about life on Mars."




Beagle had a system of deployable "petal" panels

The outcome will be deeply frustrating to the science and engineering teams behind the project, because they will now realise just how close they came to success.

Indeed, MRO's data confirms that Beagle landed just 5km from the centre of its targeted touchdown zone.

This was an ellipse, 500km by 100km, on a flat, near-equatorial plain known as Isidis. To be off-centre by such a small margin amounts to a bulls-eye.

Mars Express

Beagle2 was carried to the Red Planet by the European Space Agency's Mars Express (MEx) orbiter, which remains in working order today.

MEx released the little robot on to its landing trajectory on 19 December 2003. It even snapped a picture of Beagle, in its entry capsule, receding into the distance. What followed was a mystery.

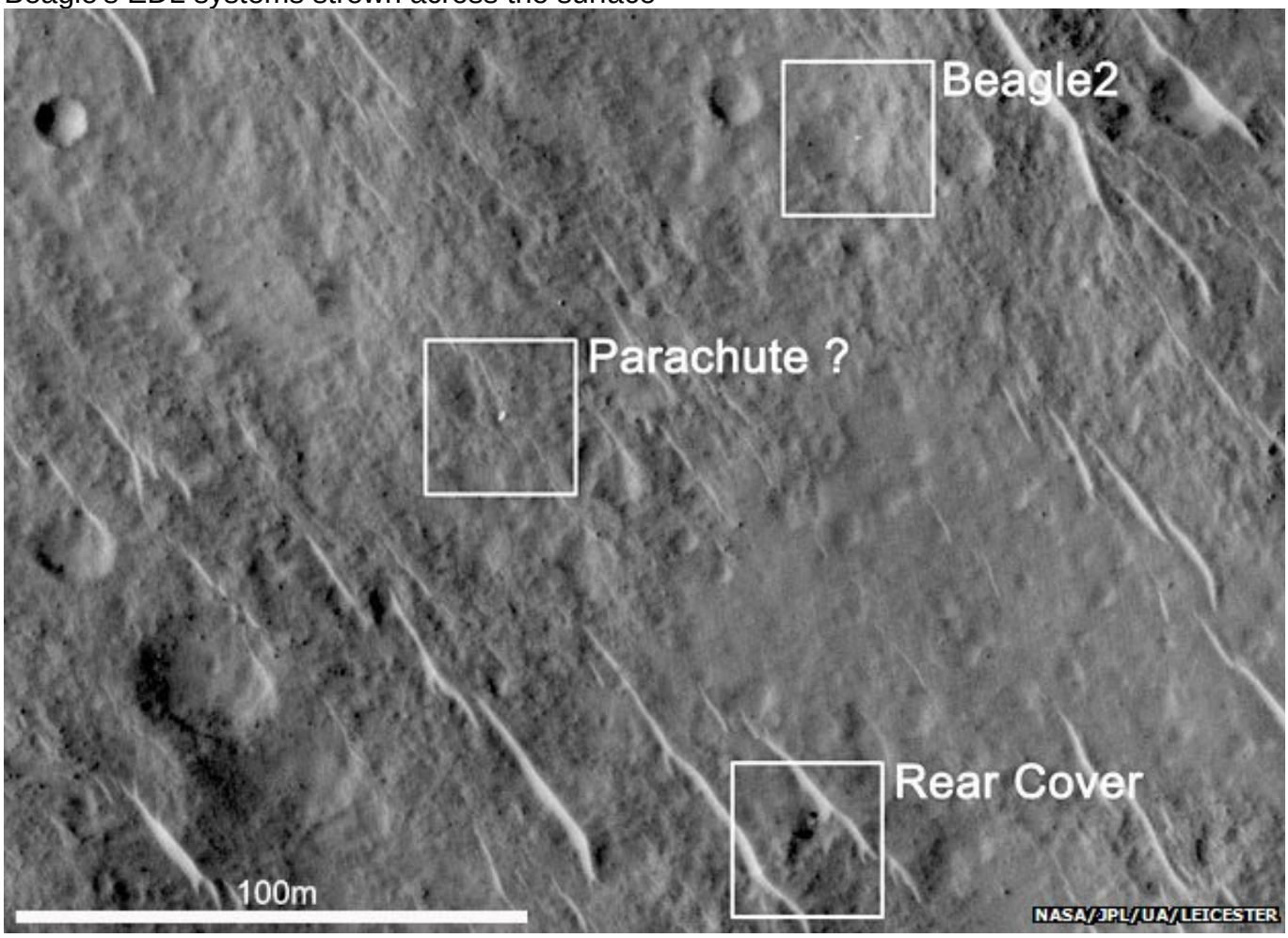
Various theories were posited for the failure of the probe to make contact after the expected landing time of 02:45 GMT on 25 December.

The Beagle team itself suspected the robot was caught out by a Martian atmosphere that was thinner than the one for which it had planned.

This would have meant it was travelling too fast as it approached the surface.

But the pictures suggest that all elements of the entry, descent and landing (EDL) system did a job.

Beagle's EDL systems strewn across the surface




- The image features are at the limits of what MRO can see
- But the objects and separations conform to what is expected
- Beagle is partially deployed, with two (max three) petals out
- Backshell with the drogue chute and main chute are close by
- Scenario in images confirms that EDL software did its job
- Beagle's on-surface operations software began its tasks
- Why deployment tasks were not completed is unknown
- Component damage or airbag obstruction are possibilities
- Incomplete deployment meant radio transmitter was blinded
- Nothing can be done to bring the Beagle probe back to life

The entry capsule clearly protected the probe from the heat of rubbing up against the Martian atmosphere, and the parachutes and bouncing bags must have come out to soften the final approach to the surface.

In the MRO images, it is even possible to identify some of the EDL elements on the ground close to Beagle.

Official inquiry

The Commission of Inquiry - jointly set up by the European Space Agency (Esa) and the

forerunner of what is now the UK Space Agency - blamed the failure on a mix of poor management and inadequate testing of systems and components. It also conceded that too little money had been allocated to the Beagle project at its outset.

With a total budget of near £50m, it remains one of the cheapest interplanetary missions ever devised.

The report's 19 recommendations included the demand that communications with future probes be maintained through the various descent phases.

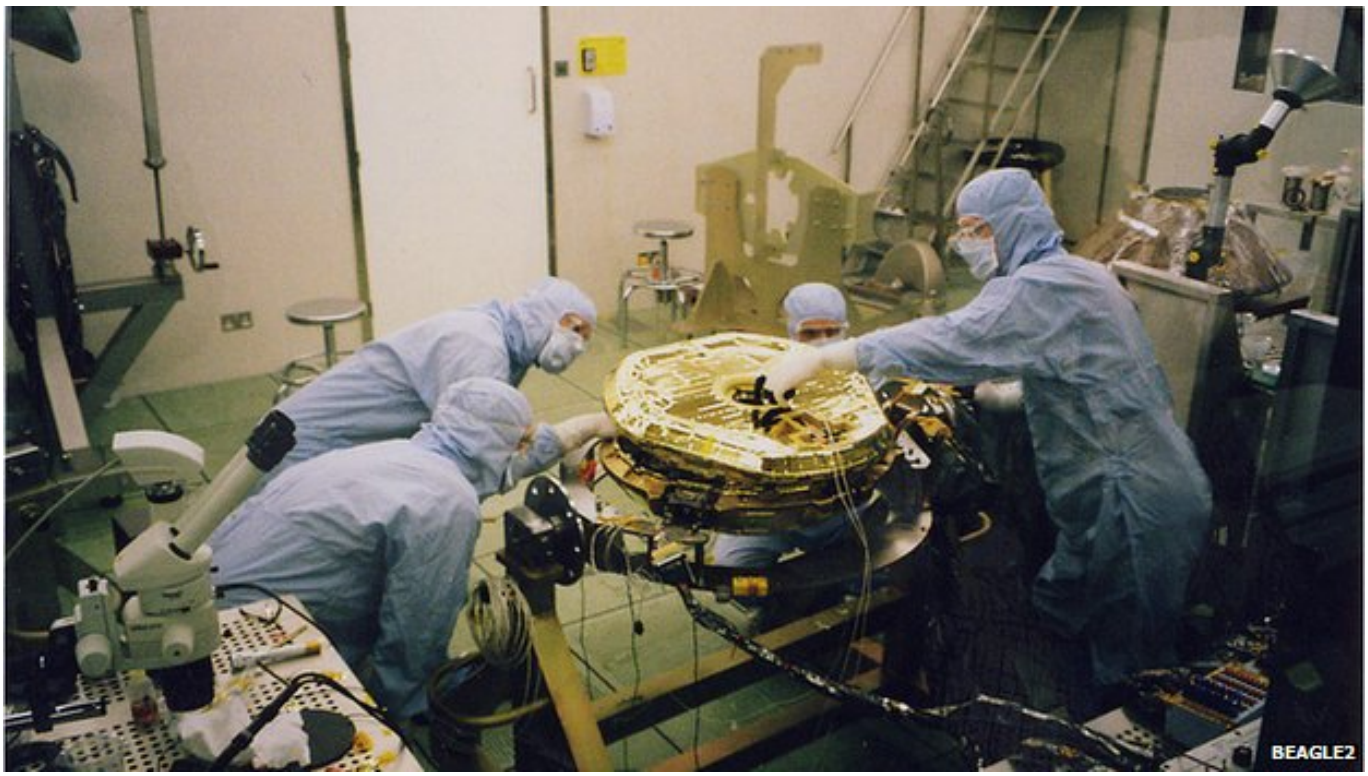
This has become standard practice in recent years, but with Beagle its last contact was essentially that black and white photo of it moving away from the MEx orbiter six days prior to landing.

When Esa's ExoMars rover tries to land on the surface of the Red Planet in 2019, it will be relaying information all the way down.

The landing hardware for this mission is being built by the Russians, but its key sensor technologies, such as the descent radar, are being developed in Europe and will be tested on a demonstration landing in late 2016.

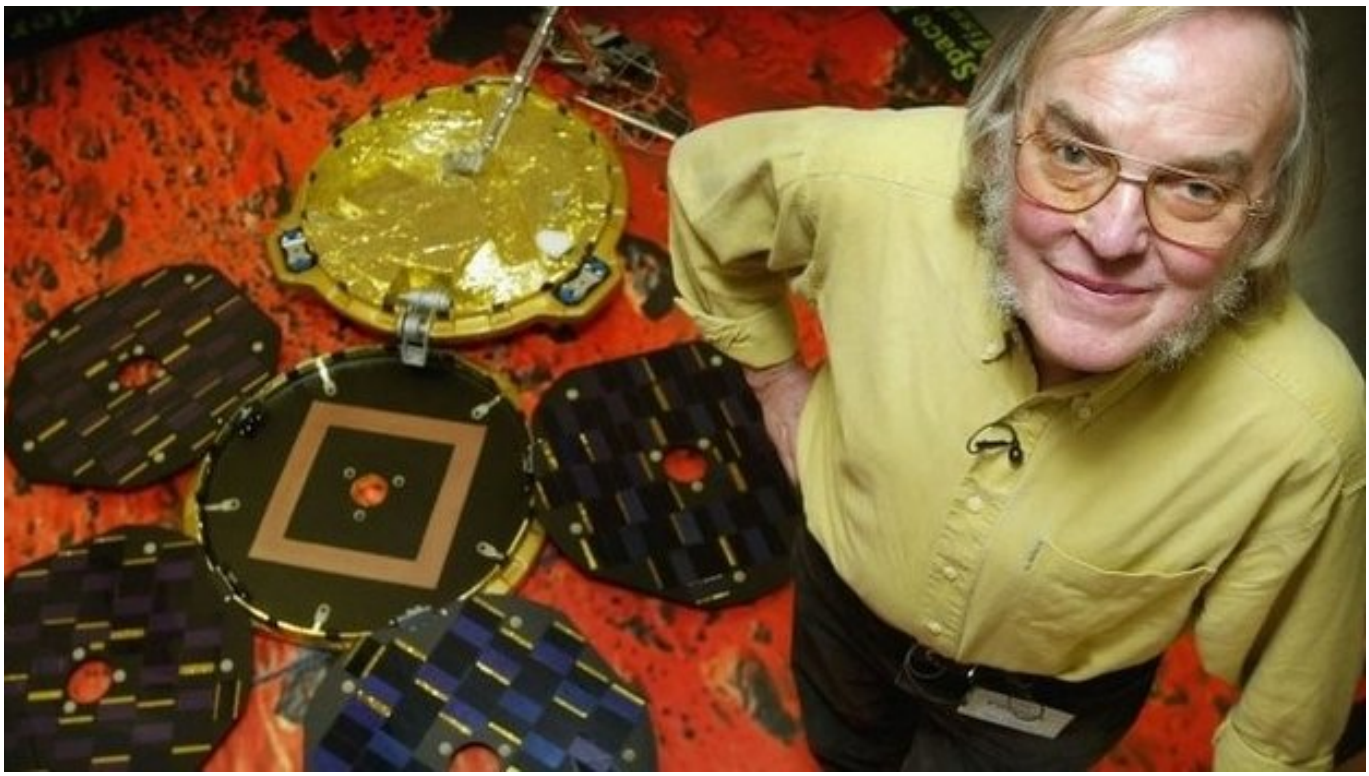
Esa director general Jean-Jacques Dordain told BBC News: "We have already taken a lot of lessons from the 'failure' of Beagle, and especially on the need to be connected, because if we had been connected in terms of communications we would have known we were on Planet Mars."

And reflecting on Colin Pillinger's role in the project he added: "It's a pity that he is not with us anymore, because this was his baby. And I'm really glad - really glad - [it's been found] for him."




The official Beagle2 inquiry made recommendations that will shape Esa's next Mars landing efforts


The ExoMars rover is currently in development with Airbus in the UK



In the public's mind, Colin Pillinger became synonymous with the Mars mission


At far left, MEx snaps Beagle heading away towards Mars in its protective entry shell