



Britain's future in space

Clip taken from 'The Sky at Night: Mysterious Mars', BBC Four.

MAGGIE ADERIN-POCOCK:

I'm currently standing on what appears to be a patch of the Red Planet right here on Earth. This is the Mars Yard, built by Airbus, to test the ExoMars rover and put it through its paces. Now, that's really necessary because ExoMars is going to go to a very alien environment.

I've got Abbie Hutty here, who's the structural engineer on the ExoMars project. So what are the challenges that ExoMars will face on the real Martian surface?

ABBIE HUTTY:

One of the first things that we've got to consider is that Mars is really very cold, so we've got night-time temperatures that go down to -125 degrees Celsius.

MAGGIE ADERIN-POCOCK:

That's brisk.

ABBIE HUTTY:

Yes, a little bit chilly. And then during the day it might not even get much warmer than -85. So, you're going all the way between those two, and materials, as we know, expand and contract as they go through the different temperatures. That's especially a problem where you've got structures that might be made of more than one different type of material because where those two materials meet, they actually just tear themselves apart from each other.

MAGGIE ADERIN-POCOCK:

I guess radiation is a problem, too?

ABBIE HUTTY:

Well, yes, we've only got 1% of the atmosphere on Mars to what we have on Earth. So down on the Martian surface, you are receiving a lot more of that radiation dose and that can be really damaging for your electronics and also for optical devices, like lenses can blacken with that radiation dose and that can obviously have a huge impact on how far you can see or your senses that require those optics.

MAGGIE ADERIN-POCOCK:

So, this is a prototype called Bryan, one of a series of prototypes and, looking at it, the wheels are a bit freaky. How do these work?

ABBIE HUTTY:

Well, we've actually had to develop these specifically for the Mars project because we can't take rubber tyres with us. Rubber is an organic molecule.

MAGGIE ADERIN-POCOCK:

Yes, and you're looking for signs of life.

ABBIE HUTTY:

Absolutely, so we've got very strict regulations in place to make sure that we don't take anything with us that could be in any way confused for an organic molecule. So we have developed these wheels. They are entirely metallic, but you've also got to retain the flexibility of the wheel.

MAGGIE ADERIN-POCOCK:

That you'd get from rubber.

ABBIE HUTTY:

So we've got these very thin wafers of metal that actually are still flexible because they are so thin.

MAGGIE ADERIN-POCOCK:

But how do you navigate across the Martian surface?

ABBIE HUTTY:

Well, that's one of the really big developments with ExoMars and that is one of the reasons that we've got this Mars Yard here. Because you've got such a long-distance to Mars, it means you've actually got a 22-minute delay between sending your signal and it being received, so all of our rovers are going to be able to actually autonomously navigate around the surface. We've got two cameras at the top of the mast so we can see in 3-D. It can build up a map of how big the obstacles are and where they are in front of it and then it can actually classify the different areas into: 'This is too big a rock, I can't climb over this,' or, 'This is a safe, flat bit, this is good to climb over,' and then it can pick its own path through that map.

MAGGIE ADERIN-POCOCK:

Well, I can't wait until ExoMars gets to Mars.