MOONS OF THE SOLAR SYSTEM
Titan

Narrator:
There is only one moon in the whole Solar system with an atmosphere . . . Titan, largest moon of Saturn.
Shrouded in thick haze, until recently the surface of this mysterious world remained a mystery.

Professor John Zarnecki:
Every time I look through the telescope and I see Titan I find it incredible to think that something we designed and built is sitting there on the surface. It landed in 2005. It's there now . . . it will always be there. Incredible.

Dr Athena Coustenis:
Titan is a very intriguing object. It has been so for centuries now, though we have been studying it for 350 years. We had never been able to glimpse through its thick atmosphere before and so with Cassini Huygens this was our chance to go there and explore this exciting new world.

Clip:
And lift off of the Cassini Spacecraft on a billion mile trek to Saturn.

Narrrator:
Launched in 1997, the Cassini Huygens spacecraft was the most ambitious mission ever sent to the outer solar system. The massive Cassini orbiter carried with it a tiny lander called Huygens.

Dr Athena Coustenis:
It took seven and a half years to bring the orbiter and the probe it was carrying out of the Saturnian system the Huygens probe was launched into Titan in December 2004 and made a fantastic descent January 2005 through Titan's atmosphere, landed on the surface. I think it has been the most thrilling moment in my whole career.

Professor John Zarnecki:
The probe carried six instruments and one of those was ours, led by the Open University and it measured a whole range of parameters on the surface and ours was the first instrument to touch the surface when we landed

Mark Leese:
When we were initially designing the instrument we were told that we would get a maximum of three minutes on the surface before the probe died. Perhaps the hardest thing was not actually knowing what we were going to land on and what we would have to measure so the landing was a very, very tense moment.

Clip:
We think we just hit the surface.

John:
It's still hard for me to describe the emotions of that day you know it was fifteen years of work, it was the culmination of that.

Dr Athena Coustenis:
We're stood in front of our screens, you know, looking to see the data coming down. We don't know what to expect at all.

In the beginning you can't see anything, it's the haze, it's the clouds and all of a sudden you begin to see these dark lines and this huge dark area in the middle and you're thinking what is this. And you don't know, but it's going further down, further down. Before you know it you are looking at channels. . .

You see the shoreline. It looks very much like the Cote D'Azur, and then you see all these rivers and streaks coming down into the lake. Some of them are bright and some of them are dark and we still don't know what makes them bright or dark, but we do know that there was a point in time where liquid was flowing through these streaks and these rivers.

I actually saw this image, hanging there on the wall, that had come just through the computer and I said "What's that Mars image doing right there? Please take it away we are waiting for Titan." and my colleague from the team turned round and said, "That's Titan." And I felt like, you know, I started shaking . . . this is Titan really, it's got pebbles, it's got colour. I had never imagined. this. It's fantastic.

Dr Dominic Fortes:
The Huygens probe landed on a flat area of fine grade sediments, rounded pebbles and small channels, not dissimilar to the area where I'm standing now. I'm on a mud flat by the side of a tidal river estuary. We have lots of fine grain sedimentary material being exposed, lots of little river channels and small rounded pebbles rather like this one which I've just picked up. The liquid here, obviously, is water, but on Titan it's far too cold for water, it's 180 degrees below zero, and the kind of liquid that we think is present on Titan is a mixture of methane and ethane

Dr Athena Coustenis:
The Huygens probe actually showed us that there was indication of liquid methane on Titan's surface. We saw it through evaporation, we saw it through the channels and probably the dry lake, but since then we've got real evidence that there is liquid methane on Titan's surface and that came from the mother spacecraft, from Cassini orbiter, that took those beautiful images in the North Pole of Titan showing the extended lakes that they are there and also that these lakes are filled with real liquid.

Dr Dominic Fortes:
We know that the lakes exist both at the North Pole of Titan and at the South Pole of Titan and in Titan's current season the aerial distribution is much greater in the North than in the South.

Dr Athena Coustenis:
On Earth we have the water vapour cycle that brings us the clouds, the rain and so on. On Titan the same thing we have but with Methane.

Dr Dominic Fortes:
The current thinking is that you get these very high energy rainfall events, similar to monsoons on the Earth which produce flash flooding and deposit very large amounts of material, both fine grained and coarser material in a very short period of time and then the area dries up.

Mark Leese:
We knew we were on some kind of dried up river bed or dried up lake bed, so my first thought was actually that we'd hit the right place but the wrong season. The liquid's all gone so we need to come back here.

Narrator:
Following the great success of Cassini Huygens, there are now plans to return, with a mission called the Titan Mare Explorer.

Professor John Zarnecki: With Huygens my hope had always been that we would splash down on Titan, but of course we didn't know where the seas were, if they even existed, but now with the Time Project we're going to aim for the centre of one of the largest seas.

Mark Leese:
The plan is that the probe will have a direct entry into Titan, descend under a heat shield and parachute, rather like Huygens and then splash down on the surface. The lifetime for the nominal mission is six Titan days, which is actually ninety six Earth days.

Professor John Zarnecki:
Once we're there we're going to study everything we can about that sea and then, hopefully, as we drift in the wind and we'll end up at one of the shores we can see how a hydrocarbon sea sculpts a shore on an icy body like Titan.

Dr Athena Coustenis:
For someone like me who has followed the Cassini Huygens mission from the beginning, there is only one thing we really want to do . . . we want to go back.

Professor John Zarnecki:
Titan is of course unique in our Solar system, the only planetary satellite with an atmosphere, not just any old atmosphere. It's a very complex, rich atmosphere. It's got an exotic surface, hydrocarbon seas and lakes. What a mix . . . and… I'm biased but I think it's the most exciting place in the Solar System