



## **Mission to Titan**

*Titan: landing*

### **Adam Hart-Davis:**

This has been an incredibly risky mission. Years and years of planning coming down to just a few hours as Huygens approached Titan. The tension here on the ground has been pretty nearly unbearable, and Lucie spent the day with the Huygens team watching the events unfold.

### **Lucie:**

The project scientists start the day with a good breakfast, ahead of the most important few hours of their careers. At the same time in space, Huygens wakes up and Cassini turns its antenna to point at Titan. A sequence of events has been set in motion that can only end in one of two ways: either disaster for the Huygens project, or the successful landing of a spacecraft on the most distant cosmic object in history.

### **David Southwood, ESA Director of Science:**

We've done everything we can. We've got the best team in the world; in fact it's a world team, so nervous anticipation, that's all I can say.

### **Lucie:**

Two hours later in space Huygens first encounters Titan's hazy upper atmosphere and the HASI instrument starts collecting data. It's still over 800 miles away from the surface. As the atmosphere gets thicker Huygens slows from twelve-and-a-half thousand miles an hour to a little under 900 miles an hour. The craft experiences a braking force equivalent to fourteen times the force of gravity on Earth, and the front of the probe heats up to nearly 2,000 degrees centigrade. A pilot parachute opens, pulling away the rear cover to expose the main parachute which then deploys. The craft slows to less than 200 miles an hour, and with entry complete and its job done, the heat shield is discarded. Thirty seconds later the rest of the instruments switch on and start taking measurements, and the first package of data is broadcast back into space to be downloaded by Cassini. Although this signal is only as powerful as a mobile 'phone, the scientists believe that they may just be able to pick it up from Earth. Over an hour later, the signal has crossed nearly a billion miles of space and the scientists have their answer.

### **Claudio Sollazzo, Huygens Mission Operations Manager:**

Well we've just received the signal from the probe at Green Bank Radio Telescopes, so we know that the probe has passed through the fiery entry in the atmosphere and all the parachutes have been deployed, so we are only waiting for the data now, so everything is okay.

### **Lucie:**

They can't extract any data from this signal, it's too weak, but this heartbeat, as the Mission Scientists are calling it, direct from Huygens, at least lets them know that the probe is still alive.

### **Dr Athena Coustenis, Huygens Scientist and Titan Expert:**

The heat shield has now burnt through, it has held on and has protected the Huygens probe, and the parachute has deployed, and this is the carry-off/carrier signal telling us that now there is communication between Huygens and Cassini. I've been jumping up and down ever since I've seen this. This is important news to us.

### **Lucie:**

By now, just 75 miles above the surface of Titan, the main shoot has been jettisoned and the faster stabiliser shoot is out. Thirty miles above the surface, the probe passes through Titan's

coldest layer, around minus 200 degrees centigrade, ice forms on the outside of Huygens. Back in Germany with no data, there's nothing to do but wait and imagine what the probe must be experiencing. At 1.23 the descent imager lamp is switched on and at 1.46 Huygens becomes the first man-made object to touch down on Titan. The probe continues to collect data for more than two hours and back in Germany the science teams have just received more good news.

**Jean-Pierre Lebreton, Huygens Project Scientist:**

The last time I was updated, the probe was still transmitting under the carrier, the tone was received in Australia by at least two telescopes.

**Lucie:**

Against all the odds, and for considerably longer than they had expected, they're still picking up Huygens faint heartbeat.

**Mike Bushrow, Imaging Team:**

We first heard the heartbeat around 11.30 Darmstadt time. From what I understand we've continued to hear the heartbeat for about three hours, out of a two-and-a-half hour mission, which means it's really likely to have survived impact with the surface and continued for at least half-an-hour afterwards with more data. Excellent surface science.

**Lucie:**

At 2.36 Cassini passes over the horizon of Titan, the connection with Huygens is lost and the mission comes to an end. Ten minutes later Cassini turns to Earth and using its powerful transmitter, over four-and-a-half hours' worth of data are sent home. An hour later in Germany, the world's press and the project scientists get the message they've all been waiting for - the Huygens' data has finally arrived.

**Carolyn Porco, Cassini Imaging Team Leader:**

It's big for everybody, I mean really we can look now at Saturn in the sky and know we've been there, we've made our mark and the solar system has become a very much smaller place and that is a very big thing.

**David Southwood, ESA Director of Science:**

We're in very good shape, everything came back as it should, we've got the engineering in place, then we've started getting the science data in place. We have to turn the scientists to work on that now but, so far, everything has been 'on-the-nail', or better than 'on-the-nail'. How do I feel? I feel over the moon of Saturn.

**Adam Hart-Davis:**

So John, when that data first came in it must have been something of a relief?

**Prof John Zarnecki, Open University:**

Well actually it was nearly a nightmare because we had about three minutes when we were expecting data and we saw absolutely nothing on the screens. We thought the mission was lost, but suddenly they lit up, green figures all over the place meaning the data was coming down from Cassini, and then just the roof took off.

**Adam Hart-Davis:**

It must have been fantastic, mustn't it?