INTERNATIONAL ASTRONAUTICAL FEDERATION

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IAC 2013 – HIGHLIGHT LECTURE 1

Voyager's journey to interstellar space

Delegates at the 64th International Astronautical Congress (IAC) in Beijing, China, packed a special Highlight lecture session this evening (Tuesday, 24 September 2013) to hear first-hand from mission project scientist Dr Edward C. Stone about the epic journey of Voyager 1.

On August 25 2013, the spacecraft was confirmed as the first man-made object to leave the solar system and move into interstellar space.

Dr Stone, a well-known spokesman for the Voyager missions since their launch in 1972 and a Director of NASA's JPL between 1991 and 2001, recounted the story of Voyager 1 and its historic passage this summer into interstellar space.

Voyager 1 departed Earth on 5 September 1977, a few days after its sister spacecraft, Voyager 2. The pair's primary objective was to survey the planets Jupiter, Saturn, Uranus and Neptune - a task they completed in 1989.

Dr Stone briefly described the spacecraft, science payloads and 4.6m antenna with distinctive magnetometer boom. Designed in the 1960s, the Voyagers both have tiny computer systems compared to modern day standards – A standard mobile phone currently has 240,000 times more memory than Voyager.

Part of the longevity of the mission is down to the power system which he described as a "simple robust power supply" and the reason why Voyager 1 is still sending back signals 365 days a year.

Voyager 1 has three radioisotope thermoelectric generators (RTGs) mounted on the boom and each contains 24 pressed plutonium-238 oxide spheres generating about 470 watts of electric power at the time of launch.

The power output of the RTGs has declined over time (due to the 87.7 year half-life of the fuel and degradation of the thermocouples) but Prof Stone said it was expected the Voyager 1 RTGs would continue to its remaining operations until around 2025.

Commenting on some of the science results, Dr Stone said that before Voyager the only known volcanoes in the solar system were on Earth.

“Time after time, no matter how smart we thought we were getting, we had surprises - a new view of the solar system emerged and we realised what a remarkable diversity of bodies there are in the solar system,” he said. “Our view of the solar system had been much too limited.”

He explained that leaving the Sun’s heliosphere was part of the original objective. “We had no real idea at the time of what this meant only hope because we didn’t know how big it was or whether the spacecraft would last long enough.”

The data that finally convinced the mission team that Voyager had arrived in interstellar space came in the summer of this year when the team was able to confirm a sudden change in the density of charged particles in Voyager's vicinity.

They were able to calculate that the moment of escape to have occurred on or about 25 August 2012.

Dr Stone explained the different stages of the heliosphere crossed by Voyager 1 on its outward journey - the ‘termination shock' (an area where particles from the Sun begin to slow and clash with matter from deep space); the ‘helios heath' (a vast, turbulent expanse where the solar wind piles up as it presses outward against interstellar matter); and the ‘heliopause' (the boundary between the solar wind and the interstellar wind, where the pressure of both are in balance).

He estimated that there remains enough electrical power on Voyager 1 to power the spacecraft’s remaining four instruments until 2020 - then the team will progressively turn them off until the last one around 2025.

“Welcome to interstellar space”, concluded Dr Stone to rapturous applause.

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