HAYABUSA: The first Space Odyssey to an "Asteroid"

- Dr. Pankajakshan Thadathil

The nail-biting seven-year journey of a Japanese spacecraft to an asteroid and back ended on 13 June 2010, captivating the public and possibly giving the Japan Aerospace Exploration Agency (JAXA) a new lease on life. When its re-entry capsule floated into the Australian outback on 13 June 2010, the Hayabusa probe became the first spacecraft to land on a celestial body other than the Moon and return to Earth. The main goal of the mission was to bring back samples of surface materials from the asteroid "Itokawa", which orbits some 300 million km away from Earth. But the return of the capsule alone is expected to boost Japan's space business, and JAXA's deft handling of the many glitches that occurred during the voyage could help the agency fend off critics. The capsule separated from Hayabusa's main body at around 8 p.m. on 13 June 2010. The craft itself subsequently burned up in the atmosphere, sending streaks of fire across the sky. Meanwhile, the capsule sped through the atmosphere, opened its parachutes and drifted down into the Woomera desert in South Australia.

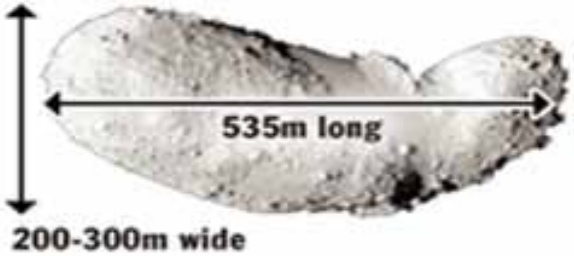
Hayabusa had traveled billions of kilometers, but the capsule still had a few more to go. Recovered in Woomera on 14 June 2010, it was flown to Tokyo International Airport at Haneda on June 17. It finally arrived at JAXA's Sagamihara Campus in Kanagawa Prefecture in the predawn hours of June 18. It could take as long as half a year to analyze its contents. Hayabusa, Japanese for "falcon", hitched a ride in May 2003 on an M-5 rocket from the Uchinoura Space Center in Kagoshima Prefecture. While orbiting Earth, it worked its way toward Itokawa, which follows a path crossing from outside the orbit of Mars to inside the orbit of Earth. The craft reached Itokawa in 2005. It made hard landings in order to kick up debris, which was to be captured in a 40 x 20cm container. But the probe failed to shoot a metallic projectile into the asteroid's surface as planned, which would have aided the collection of samples.

Scientists hope to find a combination of the minerals that make up Itokawa, or at least gases from the asteroid's surface.. Analysis of the debris could help to explain the origins of our solar system. It is thought that the Sun and planets formed some 4.6 billion years ago from an aggregation of gaseous materials in space. Since then, drastic changes on Earth have hidden the answers to many questions about its initial state. ***Asteroids, however, remain as they were when they were formed, so scientists are keen to learn from them what substances were widespread during the solar system's first days.*** Still, even if the capsule does not contain enough to unlock such secrets, all will not be lost. The Hayabusa mission was not solely about bringing back space dust - it was also conducted to test technologies for long-distance round-trip flights to other planets. This much we know for sure: Hayabusa traveled a heck of a long way. The craft clocked a total of some 6 billion km, about the same distance Earth travels in six trips around the Sun.

It's rough up there
Adventures of Hayabusa

- **May 2003:** Launched on M-5 rocket from Uchinoura Space center, Kagoshima Prefecture
- **May 2004:** Accelerated using Earth's gravity in swingby maneuver, set on course to Itokawa asteroid
- **November 2005:** Lands on Itokawa twice to collect samples
- **December 2005:** Fuel leak causes problems with attitude control; radio communications with Earth lost
- **January 2006:** Radio communications with Earth restored
- **April 2007:** Return trip to Earth begins
- **November 2009:** Problems with ion engines
- **April-June 2010:** Orbital adjustments conducted to direct spacecraft toward re-entry
- **June 13, 2010:** Lands in Australia

Source: The Nikkei



Asteroid Itokawa, photographed by Hayabusa spacecraft *(Courtesy of JAXA)*