

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Dr. Byounggyun Lim  
Korea Aerospace Research Institute (KARI), Korea, Republic of

ORBITER PAYLOAD COMPOSITION STRATEGY FOR MARS EXPLORATION

**Abstract**

Mars has a great potential for the existence of life, so it is receiving a lot of attention not only for scientific research purposes but also as a second Earth. Recently, with the emergence of emerging space powers such as China, India, UAE, Mars exploration is entering a new renaissance era. India launched its Mars Orbiter in 2013 and successfully entered Mars' orbit in 2014, and UAE also successfully placed its orbiter in Mars' orbit in 2021. China simultaneously launched a Mars orbiter, lander, and rover in 2020, all of which were successful. The United States successfully landed the 1,025 kg Perseverance rover, the heaviest to date, on the surface of Mars in 2021, and successfully conducted a helicopter flight on a planet outside Earth for the first time.

One of the biggest goals of Mars exploration is the search for life. Therefore, if you look at the distribution of landing sites for various landers, they landed near sea level in the past. Traces of water on Mars were discovered based on exploration information from several landers and orbiters so far. In addition, when looking at the successful landings of many landers attempted so far, there were many cases of failed landings. To reduce such failures, it is important to secure accurate information about the landing site in advance. For this reason, the orbiter's payload is very useful for acquiring preliminary information.

Early orbiters were often equipped with optical payloads. Viking1 is mainly equipped with an optical camera system and an infrared spectrometer for water vapor analysis and an infrared radiometer for generating temperature map. India's orbiter, launched in 2013, is also equipped with a camera and an infrared sensor. However, in the case of China, which recently succeeded in launching, it was found that it is equipped with a search radar in addition to a camera. It is presumed that the purpose is to investigate traces of water on the surface and conduct ground surveys to select a landing site. In the case of Korea, which is a latecomer, it seems to be a good strategy to mount a camera as a main payload and a microwave payload as a sub-payload. Especially, SAR (synthetic aperture radar), a representative microwave payload, is expected to have many advantages, such as being able to map ground characteristics and a moisture content over a wide range of observation areas.