16th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Interactive Presentations - 16th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (IP)

Author: Mr. Wei Dai
China Academy of Launch Vehicle Technology (CALT), China

EJECTIVE AND DISTRIBUTED INTELLIGENT MARS DETECTION SYSTEM

Abstract

Mars is the most earth-like planet in the solar system. The exploration of Mars began in 1960s. With the development of space technology, human become closer and closer towards this red planet with brains, talent, and perseverance.Factors such as low density of atmosphere, complexity of terrain and landforms, and high frequency of sand storm, results that it is impossible to probe Mars by using the aerodynamics-based craft. On the other hand, the detection systems based on the traditional Mars rover have limitation in detection range and energy sustainability. The size of detection area and duration lasted can hardly satisfy the requirement. To overcome these problems, this paper proposes an ejective and distributed intelligent Mars probe system. This distributed probe system integrates Mars rover and spherical probe. The spherical probes are distributed several kilometers around the Mars rover via ejection. They are connected with the Mars rover via cables to handle problems such as energy supply, message downlink, and detector recycling. These spherical probes are equipped with different devices and can detects the landforms and decide the motion pattern such as rolling down, crawl up, bounce across gully. They detect an area with size of about 1 kilometer and send detailed information back to the Mars rover to process and send back to Earth. After recycling these probes, the rover can move to another area to probe. Thus, this probe system has the advantage of wide coverage, strong detection ability, low energy consumption and long service life, which will greatly enhance human's capacity to understand of Mars.The paper analyzes the technology used by the American Mars exploration program, and further describes the ejective Mars probe system, including its characteristics, system composition and operational principles. Matlab interactive simulation proves the validity of the design, and demonstrates the feasibility of the follow-up engineering work.