IAF SPACE SYSTEMS SYMPOSIUM (D1)
Technologies to Enable Space Systems (3)

Author: Prof. Shinichi Kimura
Tokyo University of Science, Japan

Prof. Chiaki Terashima
Tokyo University of Science, Japan
Prof. Tsutomu Iida
Tokyo University of Science, Japan
Prof. Kazuya Nakata
Tokyo University of Science, Japan
Prof. Isao Shitanda
Tokyo University of Science, Japan
Prof. Chiaki Mukai
Tokyo University of Science, Japan

THE RESEARCH CENTER FOR SPACE COLONY AT THE TOKYO UNIVERSITY OF SCIENCE DUAL SPACE-EARTH DEVELOPMENT OF FUTURE LIVING TECHNOLOGIES

Abstract

Recently, human space activities such as manned Mars exploration and lunar habitation have attracted widespread interest. To enhance human space activities, improving the technologies needed to live in space environments for long periods is essential. Many of these technologies overlap with technologies for terrestrial living. For example, remote physical and mental health monitoring-technologies that are currently being researched for aging societies-also seem to be effective in maintaining the health of a flight crew, and vegetation that flourishes with limited resources in extreme environment on Earth may be effective for food supplies in space. Tokyo University of Science (TUS) has established the Research Center for Space Colony (RCSC), funded by the Private University Research Branding Project of the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Although no individual department at TUS focuses on space technologies, TUS is home to many researchers who study myriad basic technologies; by effectively combining these technologies with space habitation, we hope to contribute to the expansion of human space activities. The RCSC focuses on the following four issues and aims to promote research on dual space-Earth development of future living technologies 1) Space agriculture research group TUS researchers are examining plant growth systems using plasma technologies, which enable nutrient generation and water purification for effective agriculture with limited resources. This research group aims to utilize such technologies for space agriculture, adapting them to space environments including microgravity. 2) Water and air purification technology research group Photocatalysts are powerful tools for water and air purification. TUS has produced considerable research on photocatalysts; part of this research group studies water and air purification technologies. This group aims to synthesize their photocatalyst water and air purification technologies into an environmental control and life support system. 3) Energy production and storage group Energy is also a crucial issue in the expansion of human space activities. TUS's unique research activities on energy production and storage, such as new type solar arrays, and difference thermionic power generation. This research group seek the way to utilize part of the technologies for the space colony. 4) Quality of life improvement group Maintaining mental and physical health is critical for realizing long-term human space activities. This research group aims to implement effective remote

mental and physical care using basic technologies researched in TUS, such as biosensor technologies and health situation modeling. In this paper, we outline the structure and plans of the RCSC.