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Author: Mr. Shigeru Imai
Japan Manned Space Systems Corporation, Japan, imai.shigeru@jamss.co.jp

ARCHITECTURE AND CONSIDERATIONS FOR HUMAN LUNAR EXPLORATION AND
SUSTAINABLE LUNAR SOCIETY

Abstract

JAMSS, Japan Manned Space Systems Corporation of Japan, has been involved in development, operation and utilization of Japanese Experimental Module of the International Space Station, so called “KIBO”, for 30 years. Since 2008, when the KIBO modules were launched and assembled to the ISS, JAMSS has been the prime contractor for KIBO operation and utilization. While several space agencies and private sectors are planning various space exploration activities aiming beyond LEO (Low Earth Orbit), JAMSS is also actively working on robotic and manned lunar surface exploration and Martian moon exploration projects enhancing knowledge and technology obtained thru the KIBO operation and utilization. In 2040, a world where 1,000 people stay on the moon all the time and 10,000 people visit every year is imagined and its feasibility and technology roadmap are discussed. In such a world, not only the minimum infrastructure necessary for residents and travelers to survive such as habitation, transportation, power, communication, food and water, but also comfortable living and entertainment are required. Also, in order to make a lunar society sustainable, not only the individual elements such as in-situ use of resources (ISRU) technology and closed circulation system, but also designing architecture and operating the infrastructure and facilities on lunar surface and in lunar vicinity so that they work together in an organic manner to improve efficiency and optimization as a whole. In this session, we will present necessary considerations for safe and comfortable life of residents in such a lunar society and our efforts of technology development to realize such society. In addition, we will present some concepts on the overall architecture and its operation including LEO, lunar vicinity and surface, and the technical elements necessary for enabling a sustainable lunar society. This includes autonomously detecting failure sign of space-infrastructure’s component and replacement, sharing resources among several infrastructures, and reuse and reconfiguration of spacecraft components after missions.