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Contribution of Moon Village to Solving Global Societal Issues (2)

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A SOLUTION OF LUNAR MANUFACTURING AND LAUNCHING BASE

**Abstract**

With the advancement of human space exploration, the moon has become a new frontier, incorporated into the earth's ecosystem. It is also an important gateway and transfer station to deep space exploration. Therefore, the world's space powers have proposed several lunar exploration and development plans, all of which regard the lunar base as an important goal. The moon has unique resources and location advantages, and it is an ideal space manufacturing and launching place, which is mainly manifested in the following aspects: (1) The lunar environment can simplify manufacturing equipments and contribute to the production of various large-scale structures and components. (2)The moon is rich in mineral resources which can be used for in-situ manufacturing. (3)The moon's gravity can greatly reduce the launch energy demand. (4)The abundant energy can be used for lunar-based manufacturing and launching. In this paper, a solution of lunar manufacturing and launching base is proposed, and several key technologies are presented. The lunar base consists of additive manufacturing system, launching system, energy system, moon-surface transportation and operation system, resource exploration and collection system, etc. The additive manufacturing system consists of raw material preparation system and additive manufacturing equipments, and the lunar infrastructures can be manufactured by additive manufacturing technologies. The launching system includes assembly and test system, launching support system and lunar-based launch vehicles. The energy system provides energy for lunar-based exploration, manufacturing, launching, and earth-moon communication. The moon-surface transportation and operation system is supplying transportation and related operation services in the lunar base and related peripheral areas, mainly including the open lunar rovers and transportation infrastructures to meet the needs of short-distance lunar surface transfer and transportation. The resource exploration and collection system includes in-situ resources exploration system and the acquisition robots. The construction of lunar manufacturing and launching base involves many key technologies, mainly focusing on in-situ resource exploration and collection, smelting and preparation of additive manufacturing materials, designing and launching of lunar-based vehicle, designing of lunar operational robot, energy utilization and management, etc. This paper comprehensively sorts out the key technologies and basic science problems of lunar manufacturing and launching base, and gives relevant solutions. It will provide reference for the construction, development and operation of human lunar base in the future.