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A SMALL LUNAR MANNED OUTPOST USING LIQUID OXYGEN METHANE COMBUSTION AS A MOON NIGHT HEAT SOURCE

Abstract

In the nearly 50 years since the last astronaut left footprints on the moon, the accumulation of new technologies has made it possible to carry out manned lunar activities for a longer period of time and with more shifts. The single-point landing mission mode of the Apollo mission cannot support the development of sustainable lunar activities. It is possible with current technologies to deploy small outposts operating on the lunar surface for a short period manned missions during lunar day, and long-term unmanned operation. Moon night survival is one of the key challenges in achieving the long-term operation of lunar outposts. In areas other than the high latitudes, there are generally 14 days without light per earth month, and the temperature is as low as -180 degree in Celsius. It is costly to carry a large number of energy storage batteries, and the use of isotope heat sources brings more safety issues. This article proposes a small lunar manned outpost that uses liquid oxygen methane as a moon night heat source. As a clean energy with high specific impulse and potential for manufacture from in-situ resources in the future, LO2/LCH4 propulsion system has been used in many future manned spacecrafts and lunar landers. The outpost proposed in the paper uses the liquid oxygen methane propellant margin as a resource for a moon-night combustion insulation system, which can support the survival needs of small outposts under low-power moon-night mode for no less than one year. Considering that the methane heating system has been widely used in daily household kitchens, house heating, etc., it is not technically difficult to achieve controllable combustion in a low-gravity environment. With small amount refuelling from each following manned missions, the small outpost can support multiple manned landing missions with quite a long life time, which will further extend after the in-situ resource production is realized in the future.