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Solar 3-D printer for lunar construction

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concept of a 3-D printer on solar energy to build permanent constructions on the moon from lunar regolith and waste is Aproposed. The main part of printer is a spherical mirror that focuses the sunlight into the working spot. Very easily mirror can be made of a thin film mirror. At this point, the temperature reaches 5000 degrees. If solid particles of lunar regolith pour to this place, they will melt therein, and connected with the substrate. With a diameter of 4 meters focusing mirror regolith processing rate is 10 g/s. During the lunar day (14 earth days), the printer will process 12 tones of regolith. The controlled movement of the spot will create a gas-tight space of any configuration entirely from local materials. The proposed construction of a 3-D printer does not contain a print head, in which the molten regolith may freeze during lunar night and disable it. After sunrise the printer will continue its work. After sunrise, the printer will continue its work. If you now run the printer on the moon, at the time of landing astronauts on him, he will have a solid frame building, able to protect the crew from cosmic radiation. Constructed building will be necessary to ensure the transition hatches sealed and provide them with life-support systems. Russian Federal Space Program for 2016-2025 envisages the creation of the necessary groundwork for a full-scale lunar exploration after 2025 and the implementation by 2030 of landing a man on the moon. Laboratory and accommodations of a permanent station on the moon shall ensure full protection of the crew from harmful cosmic radiation, in the first place from hard solar radiation. In the absence of a protective atmosphere and magnetic field on the moon, the premises must be protected sufficiently by thick coating of absorbent material. The thickness of the walls of the space module developed for placement on the lunar surface in 20 to 40 times less than required. Full protection would be enough with 5 meters layer of fused lunar regolith. We believe that it would be rational to build a multi-storey building with a wall thickness of 0.5 m. This will ensure maximum protection on the lower floors. Proposed 3-D printer for five years could construct a building with an area of about 150 m² with a ceiling height 2.5 m.

Biography

Valentin K Sysoev is a Doctor of Technical Sciences and Deputy Head of the Design Centre of FSUE NPO SA Lavochkin ("Lavochkin Association"). He is a Specialist in "Space instrumentation, laser opto-electronic devices and laser technology of non-metallic materials". He is an Author of over 200 scientific articles and patents. He is currently working on projects Luna-25, ExoMars and the creation of small high precision optoelectronic devices guidance and orientation of the spacecraft.

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