

Values and New Models for Space Exploration (10)

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LOW-COST SPACE-BASED GEOENGINEERING – A NECESSARY ALBEIT UNWELCOME SOLUTION TO CLIMATE CHANGE

Abstract

Geoengineering approaches to climate change mitigation are unpopular and regarded with suspicion. Of these, space-based approaches are regarded as unworkable and enormously costly. Yet current ineffective attempts to address global warming suggest that geoengineering will become a necessary approach to climate mitigation until clean energy sources can be implemented. Here, a space-based approach is presented that is modest in cost, fully controllable and reversible, and acts as a natural spur to the development of solar power satellites over the longer term as a clean source of energy. In particular, the low-cost approach exploits self-replication technology enabled through advanced in-situ resource utilisation with 3D printing technology on the Moon. Self-replication of 3D printing platforms will enable mass production of simple spacecraft units to implement space-based geoengineering on an enormous scale. Key elements being developed are 3D-printable electric motors and potentially 3D-printable vacuum tube-based electronics representing the most challenging of 3D printed devices. This paper will discuss recent developments on this area. In particular, advances have been made in 3D printed electric motors that suggest that robotic machines may be manufactured from lunar material. The power of such technologies will open up enormous possibilities at low cost including space-based geoengineering and eventually solar power satellites.