

SPACE SYSTEMS SYMPOSIUM (D1)

Poster Session (P)

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ACTIVE MAINTENANCE OF SPACE BASED SYSTEMS AND SATELLITES THROUGH SMART
METALS AND NANOTECHNOLOGY

Abstract

While the main focus of space missions in the past few decades has shifted to Near Earth Environments, technological advancements and an increased worldwide awareness towards space exploration have made it possible to consider deep space missions which may require hibernation of both humans and certain spacecraft subsystems. The most important requirement in such missions is the minimization of the wear and tear of spacecraft structures that shall occur due to the harshness of the space environment. In this paper, we suggest the design and development of active maintenance satellites. This is a novel concept that bears the potential to truly revolutionize space travel. The spacecraft structures may be made up of smart metals and shape memory alloys resistant to the constant bombardment by high energy particles if not to cosmic radiation altogether. Moreover, very small sized robots (miniature robots, if not nano-bots) could be stored inside the spacecraft and could come out from time to time, walk around the external and/or internal surface of the spacecraft while performing the repairs, only to go back inside their storage containers located within the spacecraft. These robots could have micro – nuclear reactors for power generation and could hence provide service for deep space missions like that of the magnitude of the Voyager space missions. Moreover, we suggest the use of these spacecrafts in a way such that they will be launched out of the space stations in order to automatically go up to the worn out satellites, or worn spacecrafts orbiting the Earth in order to repair them and perform routine maintenance operations in the case of near earth environment missions hence extending the lifetime of the space missions on a regular basis. There is great potential in this approach and it shall make space exploration much cheaper and effective