

IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)  
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NITINOL BIOMIMETIC COMPLIANT MECHANISM FOR DEEP SPACE EXPLORATION TESTED  
ONBOARD THE ISS ON MISSE PLATFORM.

**Abstract**

keyword Lunar dust Compliant mechanism Nitinol Displacement ISS MISSE

As the Apollo missions were carried out successfully through the hostile environment of the moon, many setbacks still complicated regular tasks for the astronauts, as did the lunar dust. This specific problem was then divided into nine different categories which led to the research for a solution involving compliant mechanisms for lunar and deep space exploration applications. To cope with the effects of space on materials like temperature and radiation, the search for compatible materials with these characteristics led to the design of a Nickel and Titanium alloy (Nitinol) mechanism actuated upon by Hafnium pieces thus resulting in a displacement of the material by only applying radical changes in temperature. Due to the coefficient of thermal expansion from the materials and the shape memory form from the Nickel- Titanium alloy, the mechanism will show movement due to the temperature and restore its initial form without any

other external source of energy being applied to it. The biomimetic design is inspired by the myosin and actin fibers in muscle sarcomeres making it strong and flexible aiming to develop artificial muscles for next-generation robotic arms that aid in space exploration and exoskeletons to assist astronauts.