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IAF MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Smart Materials and Adaptive Structures & Specialized Technologies, Including Nanotechnology (9)

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TABS : THERMALLY ADVANCED BIMETALLIC SUBSTRATES ADVANCED HEAT MITIGATION/UTILIZATION TECHNIQUES

Abstract

Crucial to all lunar activities is thermal control. Heat distribution and where possible utilization is critical to Transit to and from the moon, Mobility on the Moon, Energy production on the surface or in orbit as well as every aspect of communications. In the recent Human Landing System proposals NGC faced significant challenges both for orbital elements and surface elements due to thermal management and its significant impact on landed mass. These mass impacts drive propulsion system complexity and of course required propellant mass. The lunar environment presents unique challenges with thermal management which NGC and TAMU have studied and are ready to advance. Dust and reduced gravity challenges on the surface significantly degrade the effectivity of active and passive thermal distribution and rejection capabilities. TABS will pioneer deployable radiators with thin film removable dust covers. This approach is simple, universally required in the lunar architecture and easy to implement across the proposed architecture. Most importantly, this implementation is economically viable, technically feasible and universally necessary across nearly all elements of a sustainable lunar economy. Northrop Grumman is the industry leader in the design, development, and production of unique and turnkey radiator systems that provide critical thermal dissipation services to spacecraft and surface systems. NGC will integrate their proven deployable technologies with advanced capillary pump loops operable in 1/6th g environments and thermally driven shape memory alloys developed at Texas AM to deliver a lunar ready heat rejection, distribution and utilization system. Subsurface heat sinks for thermal dissipation and ice melt utilization will also be presented. Additionally, research into dust mitigation strategies will be implemented that utilize a “pull and perform” thin film technology that remains thermally conductive. Thermal management was identified by NASA in their technology road map to the Moon as a critically underdeveloped technology (NASA Technology Taxonomy). A future lunar infrastructure requires a thermally viable foundation. No other entity has explored thermally conductive disposable surfaces to address dust degradation and sub lunarian heat sinks to capitalize on natural lunar cold sinks. Additionally, our teams research into low gravity active thermal systems has been tested on Zero G parabolic flights. While other LUNA 10 groups will undoubtedly propose robotics ISRU solutions, mobility solutions and of course power generation services our teams proposal will be there to provide extensible thermal management to all clients using a network of cold plates and heat capillaries.