Multifunctional Materials and Aerospace Structures: Design, Exploration, and Education

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"The MAESTRO Lab (maestrolab.tamu.edu) led by Dr. Hartl focuses on the development of novel aerospace material and structural concepts that provide multi-physical and multifunctional responses. Material systems of interest include shape memory alloys, liquid metals, high conductivity composite laminates, and others. Laboratory investigations focus on fully three-dimensional surface deformation, strain, and thermal fields as measured on adaptive aerospace structures in a flow environment. Newly developed augmented reality (AR) and virtual reality (VR) environments allow experiential immersion into the complex data sets generated during such experiments and allow straightforward and intuitive comparison between computational mechanics results, material modeling data, and laboratory test data. This talk will review the numerous research efforts currently being pursued by students and staff working with Dr. Darren Hartl in the context of the MAESTRO Lab, including new successes toward liquid metal-augmented shape memory alloy actuators, sensory shape memory materials, new design approaches for multifunctional mechanisms, and important new findings regarding the national goal of quiet overland supersonic flight. The talk with conclude with discussion of new efforts to bring AR and VR tools into the classroom toward more immersive solid mechanics educational experiences."