

Composite Sandwich Structures Subjected to Extreme Underwater and In Air Loadings

Arun Shukla

Simon Ostrach Professor

Dynamic Photomechanics Laboratory

Department of Mechanical, Industrial and Systems Engineering

University of Rhode Island, Kingston RI 02881, USA

This talk will present experimental results on the response of composite sandwich structures under complex dynamic loading conditions. The first half will include studies on the dynamic response of novel sandwich structures when exposed to blast loadings. The results from both flat and curved sandwich panels will be discussed. A shock tube facility was utilized to apply blast loadings to sandwich composite materials under a variety of boundary conditions. Three high speed digital cameras along with 3D digital image correlation technique (DIC) were utilized to capture real time deformation of sandwich composites, as well as the development and progression of damage in them. Based on physical observations better sandwich panels were designed for blast mitigation. The second half of the talk will focus on the response of the sandwich composite panels having different core densities and clamped boundary conditions to underwater shock loadings. The near-field underwater shock loading was carried out using an explosive detonator. Real-time panel deformations were captured using high-speed stereo DIC. High speed cameras were also used to capture cavitation bubble formation in the water as well as on the structure. An energy-based comparison of performance was made for the sandwich panels. Also, fluid-structure interaction and its effect on panel deflection was investigated.