

Special Issue

Advanced Aerospace Structures: Materials, Mechanics, and Intelligent Design

Message from the Guest Editors

Advanced aerospace structures are central to the performance, safety, and affordability of contemporary flight systems, including transport aircraft, rotorcraft, reusable launch vehicles, reentry platforms, and rapidly emerging unmanned and high altitude vehicles. As operating envelopes expand toward harsher thermal loads, larger maneuver and gust environments, longer service lives, and stricter requirements on energy efficiency and sustainability, structural concepts must achieve a demanding balance of lightweight efficiency, damage tolerance, multi-functionality, and manufacturability. Progress in high-performance alloys, polymer and ceramic matrix composites, hybrid laminates, architected lattices, and multifunctional coatings is enabling finely tailored combinations of stiffness, strength, thermal stability, and environmental resistance. However, material development must be coupled with deeper insight into mechanisms across scales, including multi-axial fatigue and fracture, impact and crash-worthiness, thermo-mechanical coupling, vibration and aeroelastic phenomena, and the reliability of interfaces and joints under stochastic service loading.

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