Chairman	Dafnis Ath.
Topic	*Load path management*
Objectives	The fundamental design philosophy of advanced vehicle concepts needs to exploit directly the constitutive mechanical properties of modern materials especially of composites structures. Current lightweight assemblies in the aerospace industry mainly consist of thin-walled large structures which are further stabilized by integrating of local stiffness arrangements such as stringers, ribs and bulkheads. In addition, large sandwich structures with appropriated core/face sheet combination are also often used. Considering both local load introduction and global load distribution, the design of these structures is still subject to a conservative approach. For an optimal load-transfer capability specific load path analysis is to be performed to propose advanced constructive solutions. Regarding stiffened shell structures skeletal or geodesic grid methodology can be used. In this approach suitable primary and secondary load paths as well as direct-load application areas are defined. Furthermore, additive manufacturing techniques can contribute in the optimization of the parameters of sandwich's core materials, using not-uniform core spreading arrangement. As a result, the core structure is locally sized in order to establish suitable stiffness distribution and to strengthen/stabilize mechanically direct-load transfer areas. These approaches help to increase structural efficiency and redundancy as well as to minimize density, weight and costs. Thereby both sustained global structural integrity against external loads and stable local attachments of payloads can be provided. Load-conducting/distributing structural components such as stringers, grids and longerons are usually attached to the shell structures by adhesive bonding. Direct connections of structural components are mechanically realized by also using adhesive bonding or by specific reinforced access points referred to as "hard points". Structural components which are assembled using adhesive bonds are generally not interchangeable or demountable. Otherwise the use of hard points as interfaces enables flexible, reusable and simple assembled structural design due to the possibility of disassembly. Metallic components such as sleeves and inserts are mostly used as load-access points. Metallic fastening components such as screws, bolts and rivets take over ultimately the direct connection of the structural parts. The identification of appropriated locations for hard points, their mechanical design and sizing as well as the integration of their load bearing components into the primary structure is a challenge in the field of design/analysis of lightweight structures. When designing metallic structures, the sizing of load-bearing components of hard points is subject to a deterministic approach. Different in the design of structures with composite materials, where the sizing of hard points is generally subject to a normative recommendation and therefore it is characterized by uncertain safety margins and may be very conservative. The session will deal with the following topics: • Methods for advanced load path analysis/management minimizing fasteners and interfaces • Geodesic design and integration of primary and secondary load paths for shell structures • Uniform and not-uniform spreading of core materials of sandwich structures using both traditional and additive production • Design, mechanical behavior and integration of local load-access points • Manufacturing of lightweight structures with integrated load paths and hard points