

General Objectives and Research Topics:

The student challenge is to design a high speed, 300-passanger aircraft while demonstrating economic viability. This will require detailed investigations among and across several disciplines where both experimental and modelling approaches are welcome. Potential contributions from the attendees can be aligned with the topics listed below. If required, additional ones can be defined during the workshop:

- **Overall Design and Integration:** conceptual design of a high-speed vehicle with a close integration of propulsion units within the airframe while maximizing the overall aero-propulsive-structural efficiency, multi-functional airframe design, interior design and in-flight services, cockpit design and related ergonometry....
- **Aero-Thermo-Dynamics:** high-speed aerodynamics and stability, performance at TOL, transitional effects such as compressibility, heating, steps & gaps...; conjugate heat transfer...
- **Thermal:** active and passive thermal protection systems, cryogenic insulation....
- **Materials:** high-temperature, light-weight materials development and characterization wrt thermo-mechanical fatigue, creep etc... for long-life time characterization of airframe and propulsive structures when exposed to typical thermo-mechanical loads for high-speed vehicles...
- **Structures:** static and dynamic behaviour of integrated, multi-purpose structures for the full speed range i.e. TOL, climb, cruise,...; optimization of structural layout...
- **Systems:** design of on-board systems able to cope with the fast reaction times, environmental conditions (from cryogenic up to very high temperatures....); on-board power generation, ECLS...
- **Flight Control:** avionics, GNC, HMS, FDI etc. for high-speed vehicles; static and dynamic analysis, automatic rerouting capabilities, fast instrumentation-measurement equipment of vehicle's attitude and condition...
- **Propulsion:** variable high-speed propulsion cycles and (sc)ramjet for acceleration & cruise; intake and nozzle design, combustion processes, sloshing in tanks...
- **Combustion:** modelling and validation of high-speed combustion processes, technologies to reduce emission, combustion instabilities, improvement thermal efficiencies...
- **Environmental issues:** sonic boom, jet noise, emissions at TOL and during climb and cruise within the upper stratosphere
- **Operation, Logistics, Business:** Flight routes, market capture, turn-around times, cryogenic (re)fuelling, airport infrastructures and interfaces, cost assessment for development-manufacturing-exploitation, commercial viability...