

## **46ESS-67: Scramjet propulsion system**

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*Human mankind has always aimed to go the fastest and/or the highest. For air breathing engines this has pushed research to look at engines capable of hyper sonic speeds (speeds above Mach 3). When travelling at these speeds the air ram compression and a changing internal geometry is sufficient to compress the air for combustion and therefor no moving parts are required. As there will be no compressor and turbine the engine will have to be coupled with another propulsion system for sub-sonic operations. Normally, combustion requires the flow to be at sub-sonic conditions to allow for a stable flame and enough residence time for good combustion (turbofan, turbojet, ramjet). In scramjets however, the air speed is kept super-sonic allowing for more efficient operation at hypersonic speeds which go up to 20 times the speed of sound. Operating at these speeds and above comes with design challenges like how does this change the structure of the system? How is supersonic combustion sustained? What are the operating challenges?*