

## SMARTEES, AN EUROPEAN COLLABORATIVE RESEARCH FOR ADVANCED CERAMIC STRUCTURES IN ATMOSPHERIC THERMAL PROTECTION FROM SPACE: PROJECT OVERVIEW

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**Abstract.** *SMARTTEES addresses the development of advanced ceramic composites structures for reusable thermal protection systems. A non-dependent access to the critical space technology is required at European level [1]. Therefore, the aim of SMARTTEES is the achievement of a European autonomous technology for thermal protection systems (TPS). The solution is based on a novel reusable TPS architecture which can withstand the extreme environment conditions during earth atmospheric re-entry. A proof-of TPS design is being provided within the project, having the Advanced Reentry Vehicle (ARV) as reference mission [2]. This will be the result of the completion of the validation of the TPS performance and the achievement of a Technology Readiness Level of TRL 4. The design incorporates advanced ceramic composites [3-4] and porous structures [5] and is aided by material modeling. A computed tomography technique will be used to obtain a real model of each part of the system. The thermo-mechanical characterization of this part will be carried-out over different temperature ranges (RT-1600°C). This will help to obtain an accurate and realistic simulation of the insulation capability of the system. The output of this work will help to calculate critical design parameters. In a final stage the technology sample will be tested in a relevant ground facility simulating the re-entry conditions [6]. The testing will determine the fundamental performance and the degradation mechanisms. This final step will give insight into the overall performance of the TPS, identify possible modes of failure, and assess the efficiency of the thermal insulation and the heat fluxes into the sub-structure of a spacecraft. The ground testing outputs will be reviewed in comparison with the outputs of TPS requirements and environment specifications. The space sector may take advantage of the novel reusable TPS technologies, since there is a high potential for its use in cargo and crew space return vehicles, i.e. for a cost effective, safe and reliable return from the international space station (ISS). For more details go to: [www.smarttees-project.eu](http://www.smarttees-project.eu)*

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