

SPFI windward-side TPS ready for Application

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Around fifteen years ago ASTRIUM GmbH came up with the idea to tailor formerly purely leeward side used TPS-types (like shuttle FRSI) to windward-side application. With this the Surface Protected Flexible Insulation (SPFI) was born.

In the first years feasibility studies took place accompanied by basis developments. Then comprehensive development steps were made which finally lead to pre-qualified SPFI on panel level.

Recently within the frame of an ESA contract the SPFI assembly development and generic qualification was performed.

With this work the SPFI has reached a TRL of 5 and with the flight experiment onboard SHEFEX II capsule in autumn this year this TPS will gain a TRL of 6.

The concept is based on the former ASTRIUM developed leeward-side Flexible External Insulation (FEI) which consists mainly of a quilted ceramic micro-fiber filled insulation blanket.

In order to make such blankets applicable to the windward-side the outer surface has to be made pressure tight. In case of SPFI this is done by a thin CMC cover 'glued' on top of the blanket. The advantages like flexibility, easy to maintain and to integrate and low costs of the FEI are kept hereby to a maximum extent.

Within the frame of the recent developments emphasis was taken on the panel interface with sealing system, curved 3D panels and panels with higher thickness.

The generic qualification was done analytically and by testing for the mechanical, thermal and plasma re-entry environment.

This paper describes in general the SPFI set-up, the developments performed recently, the generic qualification, future steps and the application status.

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