

SPACE SYSTEMS SYMPOSIUM (D1)
System Engineering - Methods, Processes and Tools (1) (3)

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NEW APPROACH TO PRECISE SATELLITE THERMAL DESIGN

Abstract

Thermal design procedures are known and documented well in standards. However, each mission requires a new thermal redesign due to sensitive payloads. Manufacturing and later thermal tests of different parts or subsystems are very expensive. The goal of this work is to improve modeling of thermal design to increase fidelity of following thermal testing and shorten time of the actual testing. Thermal testing is absolutely necessary but we would like to use time inside a TVC more efficiently.

Various software can be used for thermal simulations (for example, MATLAB or ESATAN-TMS). Most problems arise at thermal interfaces (parts in contact) and we have to use approximations to represent these interfaces. Among factors that provide a strong impact on thermal resistance of thermal interfaces are touch forces, touching surfaces undulation, layers. To solve this problem a special test stand was designed and manufactured. Real pinch forces are provided by the test stand. It is better to make tests in thermal vacuum chamber for accuracy increasing by convection removal. For tests we need just a small-size material samples. This stand allows to conduct interface testing in TVC early in the development stage and implement lab results in the thermal modeling software. This will lead to better representation of material interfaces for simulations. A wider range of design decisions can be tested, saving time in the latter stages of the project.

This approach was verified with the CubETH project under development in EPF Lausanne, Switzerland.