

Marshall Problem Statement / Senior Design Topic

Problem Title: Thermal Protection System Testing

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Disciplines most appropriate to work on this problem:

- Mechanical
- Materials
- Test

Marshall Problem Statement

Background: NASA's Space Launch System (SLS) uses foam insulation for thermal protection. To ensure the Thermal Protection System (TPS) meets vehicle requirements portable tensile testing of the TPS is performed on witness panels or on flight hardware. The portable tensile testing is performed using a plug pull machine. These plug pullers are heritage tools from NASA's External Tank project during the Space Shuttle Program.

Recent/on-going research: Due to the age of the plug pull machines currently in use, we are looking to update the mechanical and electronic parts to create a new generation of plug pullers for portable tensile testing with current technologies and readily available parts. Many of the plug pullers on hand do not function at the present time and are difficult to repair due to the age of the parts. An example of a plug pull machine would be provided as well as foam materials to test the plug pull machine functionality.

Details of the problem; design constraints, requirements (if any), outcome expected: The redesigned plug pull machine should function the same as the original design. The rate of pull and plug size must remain the same to provide comparable results to current machines. The outcome expected is a reverse engineered and redesigned plug pull machine with updated and readily available electronic and mechanical parts.

Senior Design Project Rules:

1. Weekly telecons will be scheduled to maintain proper progress and prevent dead-end ventures.
2. Deliverable/s required (e.g. one semester course – a written final report; two semester course – written final report and prototype/model (if practical)).