Development of the Multi Purpose Transportation System for the Space Launch System (SLS) Core Stage (CS) Flight Article

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NASA's Multi Purpose Transportation System (MPTS) is designed to transport the Space Launch System vehicle segments by waterway and roadway. It is tasked with transporting the vehicle from where it is manufactured to its intermediate test location and final launch destination. Its design incorporates mechanisms that release degrees of freedom to prevent excessive loading during transit and ensure a successful delivery of the vehicle to its intended destination. In addition to the CS flight article, the system will also move three structural test articles and a simulated CS Pathfinder (weight, center of gravity, outer mold line dimensions, and overall length) over road terrain on four NASA centers and on the Pegasus barge. The MPTS independently supports the article at both ends while communicating as a combined unit through automated monitoring of its released degree of freedom and corrective responses. This allows the system to constrain its payload in a statically determinate manner while traversing across highly variable terrain. Multi-body simulation of the transportation route is useful to predict free-body motion within the specified travel ranges. The MPTS has completed its design and analysis developmental cycles. This unpublished paper will describe the design challenges encountered in developing this system of large scale structure which incorporates complex mechanisms. The unique techniques and methodologies developed for analytical assessment of the hardware will be also be discussed. Key results from analytical evaluations as well as ongoing performance testing will be presented.