

10 February 2006

**Proposed Technical Paper for the International Astronautics Congress (2 October, 2006, Valencia, Spain)****Title:**

“RS-25 for the NASA Cargo Launch Vehicle: The Evolution of SSME for Space Exploration”—Oral Presentation

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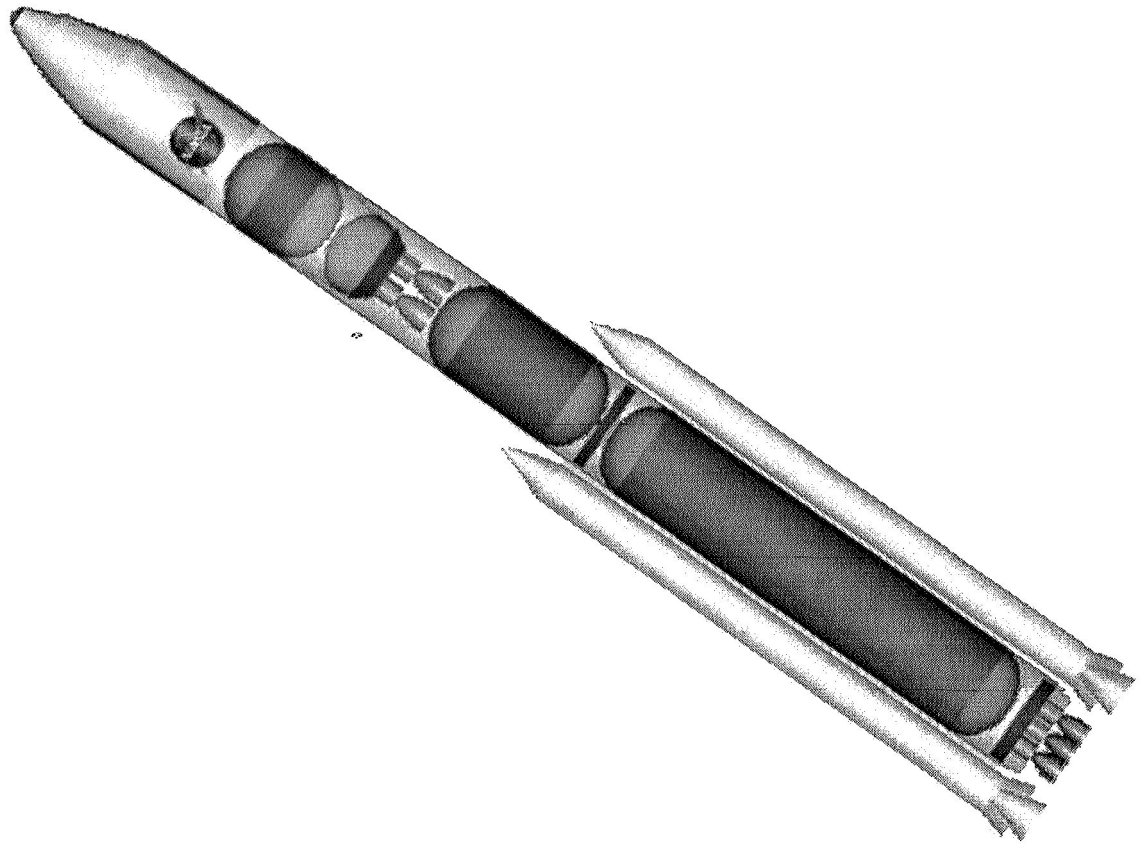
**Abstract:**

A key element of the National Vision for Space Exploration is the development of a heavy-lift Cargo Launch Vehicle (CaLV). Missions to the Moon, Mars, and beyond are only possible with the logistical capacity of putting large payloads in low-earth orbit. However, beyond simple logistics, there exists the need for this capability to be as cost effective as possible to ensure mission sustainability. An element of the CaLV project is, therefore, the development of the RS-25, which represents the evolution of the proven Space Shuttle Main Engine (SSME) into a high-performance, cost-effective expendable rocket engine.

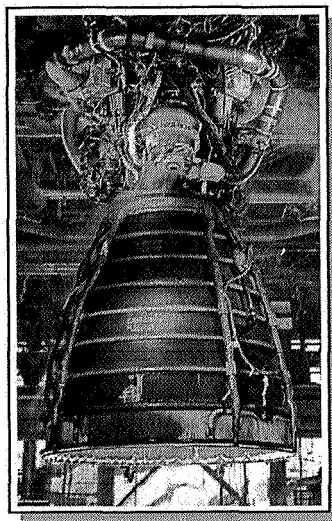
The development of the RS-25 will be built upon the foundation of over one million seconds of accumulated hot-fire time on the SSME. Yet in order to transform the reusable SSME into the more cost-effective, expendable RS-25 changes will have to be made. Thus the project will inevitably strive to maintain a balance between demonstrated heritage products and processes and the utilization of newer technology developments. Towards that end, the Core Stage Engine Office has been established at the NASA Marshall Space Flight Center to initiate the design and development of the RS-25 engine.

This paper is being written very early in the formulation phase of the RS-25 project. Therefore the focus of this paper will be to present the scope, challenges, and opportunities for the RS-25 project. Early schedules and development decisions and

plans will be explained. For not only must the RS-25 project achieve cost effectiveness through the development of new, evolved components such as a channel-wall nozzle, a new HIP-bonded main combustion chamber, and several others, it must simultaneously develop the means whereby this engine can be manufactured on a scale never envisioned for the SSME. Thus, while the overall project will span the next eight to ten years, there is little doubt that even this schedule is aggressive with a great deal of work to accomplish.



**Figure 1. The Cargo Launch Vehicle**



**Figure 2. The Space Shuttle Main Engine / RS-25**