

RS-34 Phoenix (Peacekeeper Post Boost Propulsion System) Utilization Study

Abstract

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The Advanced Concepts Office (ACO) at the NASA Marshall Space Flight Center (MSFC) in conjunction with Pratt & Whitney Rocketdyne conducted a study to evaluate potential in-space applications for the Rocketdyne produced RS-34 propulsion system. The existing RS-34 propulsion system is a remaining asset from the de-commissioned United States Air Force Peacekeeper ICBM program; specifically the pressure-fed storable bi-propellant Stage IV Post Boost Propulsion System, renamed Phoenix.

MSFC gained experience with the RS-34 propulsion system on the successful Ares I-X flight test program flown in October 2009. RS-34 propulsion system components were harvested from stages supplied by the USAF and used on the Ares I-X Roll control system (RoCS). The heritage hardware proved extremely robust and reliable and sparked interest for further utilization on other potential in-space applications. Subsequently, MSFC is working closely with the USAF to obtain all the remaining RS-34 stages for re-use opportunities. Prior to pursuit of securing the hardware, MSFC commissioned the Advanced Concepts Office to understand the capability and potential applications for the RS-34 Phoenix stage as it benefits NASA, DoD, and commercial industry.

Originally designed, the RS-34 Phoenix provided in-space six-degrees-of freedom operational maneuvering to deploy multiple payloads at various orbital locations. The RS-34 Phoenix Utilization Study sought to understand how the unique capabilities of the RS-34 Phoenix and its application to six candidate missions: 1) small satellite delivery (SSD), 2) orbital debris removal (ODR), 3) ISS re-supply, 4) SLS kick stage, 5) manned GEO servicing precursor mission, and an Earth-Moon L-2 Waypoint mission. The small satellite delivery and orbital debris removal missions were found to closely mimic the heritage RS-34 mission. It is believed that this technology will enable a small, low-cost multiple satellite delivery to multiple orbital locations with a single boost. For both the small satellite delivery and the orbital debris mission candidates, the RS-34 Phoenix requires the least amount of modification to the existing hardware. The results of the RS-34 Phoenix Utilization Study show that the system is technically sufficient to successfully support all of the missions analyzed.

The results and benefits of the RS-34 phoenix Utilization Study are presented in this paper.