

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS (D2)
Upper Stages, Space Transfer, Entry and Landing Systems (3)

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VENUS - CONCEPTUAL STUDIES FOR VEGA NEW UPPER STAGE

Abstract

With the first launch of Vega approaching, the European launch vehicle family will soon be completed. VEGA aims at transporting small research- and earth observation satellites to Low Earth Orbit (LEO). Ongoing investigations show the opportunity for a performance improvement of the launcher to cope with the evolution of P/L mass. Therefore, studies to enhance the capabilities of the launch vehicle were started.

The German National Agency (DLR) sponsors the ongoing VENUS (VEGA New Upper Stage) study, with Astrium Space Transportation as Prime Contractor and the DLR institute SART (System Analyse RaumTransport) as subcontractor; the second slice of the study was started in July 2009 and will be finalized in March 2011. Venus aims at investigating possible evolutions of the VEGA launcher. In particular, conceptual lay-outs for new storable propellant upper stages are prepared including also design studies on Engines.

This paper presents first the results of the VENUS study in the configuration P100 / Z23 / Z9A / Lxx with a pressure-fed low thrust engine in the range of 2 to 16 kN and in the configuration P100 / Zyy / Lzz with a pump-fed medium thrust engine Aestus II operating in the 45 to 56 kN thrust range.

The trade-offs of the upper stage architecture are presented, considering alternative tank architectures: common bulkhead tank, spherical / conical tank, spherical / cylindrical tank and 4 cylindrical tanks. The conceptual layouts are described and the first results of the mass budget assessment are given. Finally the Engine architectures and associated functional and performance characteristics are shown.

The content of this paper is new and was hence not presented at previous conferences. Also the attendance of the authors in Prague, Czech Republic to deliver the paper is assured.