

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

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ARES I UPPER STAGE SUBSYSTEMS DESIGN AND DEVELOPMENT

Abstract

From 2005 through early 2011, NASA conducted concept definition, design and development of the Ares I Launch Vehicle. The Ares I was conceived to serve as crew launcher for beyond low earth orbit human space exploration missions as part of the Constellation Architecture. The vehicle was configured with a single shuttle derived solid rocket booster first stage and a new liquid oxygen / liquid hydrogen upper stage, propelled by single J-2X engine. The Orion Crew Exploration Vehicle was to be mated to the forward end of the upper stage through an interface with fairings and a payload adaptor. The vehicle design passed preliminary design review in August 2008, and was nearing Critical Design Review when efforts were concluded as a result of direction to change the U.S. approach to beyond low earth orbit human space exploration. At NASA Glenn Research Center, four subsystems were developed for the Ares I upper stage. These were Thrust Vector Control (TVC) for the J-2X, Power, Purge and Hazardous Gas (PHG), and Development Flight Instrumentation (DFI). The teams working each of these subsystems achieved about 80% design completion, and extensive development testing. These efforts were extremely successful, and represent state of the art, representing the advances necessary to achievement of Ares I reliability, safety, availability and performance requirements. This paper documents the designs and development test activity and results.