



Waterhammer Modeling for the Ares I Upper Stage Reaction Control System Cold Flow Development Test Article

By National Aeronautics and Space Administration (NASA)

Biblioscholar Mrz 2013, 2013. Taschenbuch. Book Condition: Neu. 246x189x3 mm. This item is printed on demand - Print on Demand Neuware - The Upper Stage Reaction Control System provides three-axis attitude control for the Ares I launch vehicle during active Upper Stage flight. The system design must accommodate rapid thruster firing to maintain the proper launch trajectory and thus allow for the possibility to pulse multiple thrusters simultaneously. Rapid thruster valve closure creates an increase in static pressure, known as waterhammer, which propagates throughout the propellant system at pressures exceeding nominal design values. A series of development tests conducted in the fall of 2009 at Marshall Space Flight Center were performed using a water-flow test article to better understand fluid performance characteristics of the Upper Stage Reaction Control System. A subset of the tests examined waterhammer along with the subsequent pressure and frequency response in the flight-representative system and provided data to anchor numerical models. This thesis presents a comparison of waterhammer test results with numerical model and analytical results. An overview of the flight system, test article, modeling and analysis are also provided. 48 pp. Englisch.



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