

SPACE PROPULSION SYMPOSIUM (C4)
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ROLL TORQUE PREDICTION IN SRM: PRACTICAL APPLICATIONS

Abstract

During the recent launch of VEGA, the presence of a moderate roll has been observed. At the moment, the origin of this roll torque has not yet been clarified. Anyhow, the presence of roll torque in solid rocket motors (SRM) is not an unusual event. Available flight data, obtained from existing launchers, have shown the presence of a significant roll torque, especially when SRM are used. In most cases roll torque is stronger during the initial phase of flight [1] when slots in the combustion chamber are still present. Unfortunately, a model for prediction of roll torque in SRM is not yet clearly established. Analogously, CFD simulation as a tool for roll torque prediction is not a common technique, even if it is not a complete novelty [2]. In the present work a CFD approach for the prediction of roll torque in SRM will be presented. Numerical results will be compared and validated using existing flight data from X-259 Antares and Castor I as reference motors. On the basis of results obtained a correlation between internal geometry and roll torque produced will be presented. Finally, the approach will be applied also to VEGA flight data, if data will be available.

References [1] R. N. Knauber, Roll Torque Produced by Fixed–Nozzle Solid Rocket Motors, *J. Spacecraft and Rockets*, 33 (6) 1996. [2] T. Shimada, N. Sekino and Fokunaga M., Numerical Investigation of Roll Torque induced by Solid Rocket Motor Internal Flow (AIAA 2008-4891), 44th AIAA/ASME/SAE/ASEE Joint.