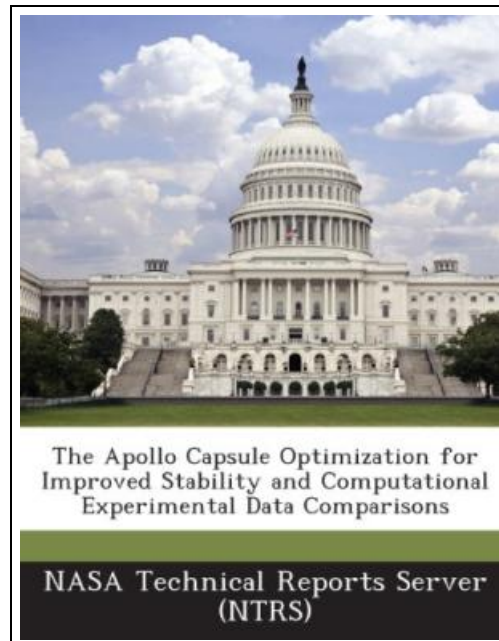


The Apollo Capsule Optimization for Improved Stability and Computational Experimental Data Comparisons



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THE APOLLO CAPSULE OPTIMIZATION FOR IMPROVED STABILITY AND COMPUTATIONAL EXPERIMENTAL DATA COMPARISONS



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Bibliogov, United States, 2013. Paperback. Book Condition: New. 246 x 189 mm. Language: English . Brand New Book ***** Print on Demand *****.Numerical optimization was employed on the Apollo Command Module to modify its external shape. The Apollo Command Module (CM) that was used on all NASA human space flights during the Apollo Space Program is stable and trimmed in an apex forward (alpha of approximately 40 to 80 degrees) position. This poses a safety risk if the CM separates from the launch tower during abort. Optimization was employed on the Apollo CM to remedy the undesirable stability characteristics of the configuration. Geometric shape changes were limited to axisymmetric modifications that altered the radius of the apex ($R_{\text{sub A}}$), base radius ($R_{\text{sub O}}$), corner radius ($R_{\text{sub C}}$), and the cone half angle (θ), while the maximum diameter of the CM was held constant. The results of multipoint optimization on the CM indicated that the cross-range performance can be improved while maintaining robust apex-aft stability with a single trim point. Navier-Stokes computations were performed on the baseline and optimized configurations and confirmed the Euler-based optimization results. Euler Analysis of ten alternative CM vehicles with different values of the above four parameters are compared with the published experimental results of numerous wind tunnel tests during the late 1960 s. These comparisons cover a wide Mach number range and a full 180-degree pitch range and show that the Euler methods are capable of fairly accurate force and moment computations and can separate the vehicle characteristics of these ten alternative configurations.



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