A COMPUTER-AIDED SIMULATION PROGRAM DESIGN FOR TESTING THE FLIGHT CONTROLLER OF A THREE AXIS STABILIZED SPACECRAFT

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ABSTRACT

To insure a reliable performance of any spacecraft over its long mission life, a thorough and coordinated attitude control subsystem testing must be conducted. The three axis motion Simulator-Hybrid computer facility at General Electric has provided the capability of testing the Attitude Control Electronics (ACE) for various satellite programs including Japanese satellite program BSE and Defense Communication Satellite DSCS-III. Although the facility has provided complete verification of analysis and simulation of all operating modes in a closed-loop fashion, the checkout procedure has proven to be extremely time-consuming. It requires real time dedicated computer support. In addition, limited sensor field of view may, in some instances, limit the scope of the test. The objective of this paper is to underline an alternate philosophy of the subsystem testing that has been extensively used to qualify the DSCS-III flight control system under various environments. It is designed to compare, on a bit by bit basis, all critical controller internal and output parameters between the flight control algorithms embedded in the ACE and a validated simulator controller. The simulated controller (truth model) is validated after careful analyses and simulation of all operating modes under all possible initial conditions. All controller parameters to be compared are assigned to CPU test port and the telemetry port. This computer-aided testing program is used to process CPU output data in an off-line autonomous basis to validate the control algorithms embedded in the ACE.