Dynamic Load Simulator For TVC Actuator Testing

Abstract:
To develop a future training tool for the TVC Branch, an Aero90 controller was used to control an H-1 hydraulic servo-actuator mounted within an Inertial Load Simulator (ILS). The Aero90 system uses closed loop control by obtaining displacement feedback from a potentiometer inside the H-1 actuator. A MATLAB/Simulink model was created to predict frequency and step responses of the system prior to experimentation. Based on empirical data, the estimated model parameters were iteratively adjusted so that the predicted response matched the experimental results. Additionally, trade studies were performed to study the feasibility of implementing dynamic loading. Due to the unpredictability of flight profiles, a time varying load must be used to accurately simulate aero-acoustic and startup transient loads. Based on this trade study, a recommendation was made for future additions to the ILS. The resulting dynamic system will serve as a more accurate simulation for future thrust vector control experimentation, including testing of the J2-X engines of the Space Launch System.

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