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ATTILA Tiltrotor Whirl Flutter Code-to-Test Correlation

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Abstract:

This paper presents the results of an ongoing correlation study performed using three different comprehensive rotorcraft codes and data obtained from the Advanced Testbed for Tiltrotor Aeroelastics (ATTILA) tiltrotor whirl flutter wind tunnel test campaign. The ATTILA testbed consists of a 1:5 scale semi-span wing with a powered, tip-mounted prop rotor reflecting the proprietary design of the Next Generation Civil TiltRotor (NGCTR). Experimental dynamic characterization of the testbed has revealed non-negligible structural nonlinearities. Post-test efforts have focused on refining the damping trends extracted from the test data, and correlating the experimental results with numerical predictions. The objective of this paper is to assess the modelling fidelity required and afforded by modern comprehensive aeromechanics codes to predict tiltrotor whirl flutter instability given an industry-representative design that exhibits structural nonlinearities. Baseline numerical flutter models fail to predict some of the observed experimental damping behaviour, but the inclusion of higher fidelity aerodynamics and exploratory friction models improves prediction accuracy. Ongoing modelling and dynamic characterization efforts aim to further clarify the mechanisms influencing the whirl flutter stability of the ATTILA testbed and enhance the predictive capabilities of the numerical methods employed.

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ATTILA Tiltrotor Whirl Flutter Code-to-Test Correlation

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