Experimentation and Data Collection For Improved Performance and Stability in Tiltrotor Aircraft

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ABSTRACT:

The overall objective of the WRATS (Wing and Rotor Aeroelastic Test System) project was to increase the performance capabilities of tiltrotor aircraft by integrating a four bladed semi-articulated soft-inplane rotor system into an environment where only stiff-inplane systems had been used before. In doing this the rotors would have reduced weight and strength requirements, which would allow for increased speed stability and maneuverability. The four bladed system is also a candidate for a possible heavy lift rotor craft.

The main focus of the testing I was involved in was to refine the data collected in a previous test of the new rotor system and to identify crossings in the natural frequencies of three key coupled-system modes, specifically the Rotor Lag Damping mode, Wing torsion/chord mode and wing beam damping mode. We used a dynamically scaled 1/5 size model of the V-22 engine mounted in a 30x30-ft hover cell to perform the tests. The engine was attached to pot, spring gauge, and other types of sensory fed into data collection software so we could see and record what the model was doing at all times.

With the information gathered in this testing, the team hopes to rectify stability problems that came up in the primary test conducted recently. In previous tests, the rotor system had shown unacceptably low damping in the Airplane configuration. By observing the damping of these key modes at different rotor speeds, they will be able to get a good idea of how they will act in a real flight situation.

KEYWORDS: tiltrotor, soft-inplane, mode, hover test, damping

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