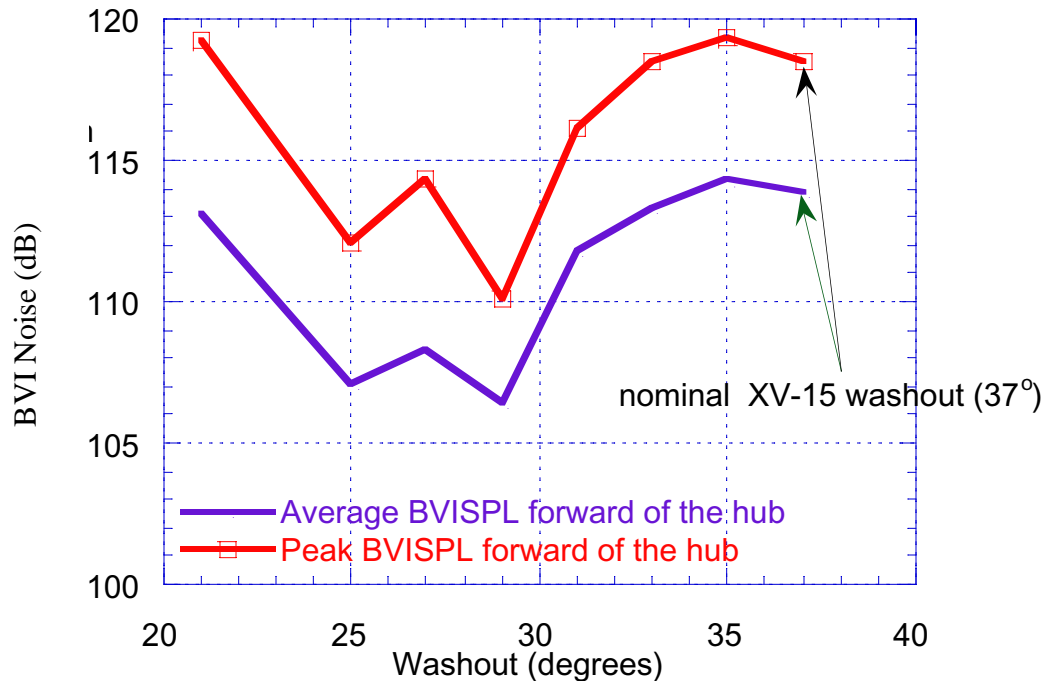


## Blade Mounted Devices for Tiltrotor Performance Enhancement and Noise Reduction

(POC: Thomas R. Norman, Aeromechanics Branch, Ext. 4-6653)

RTOP: 581-10-12



Effect of Blade Washout on Blade Vortex Interaction Noise

### BACKGROUND

The successful introduction of the civil tiltrotor into the national airspace system relies heavily on community acceptance of the vehicle. In particular, a tiltrotor with reduced noise emissions is critical. Various approaches are currently being considered to address this problem. One such approach, the application of remotely adjustable on-blade control elements to rotor blades, is receiving considerable attention. This research effort is an attempt to better define the on-blade requirements and ultimately identify a viable design implementation.

### OBJECTIVES

Determine a mix of on-blade control-surface deflection and/or in-flight twist change to produce significant payload/range enhancement and BVI noise reduction for a representative civil tiltrotor. Establish preliminary designs for adjusting blade twist in a rotating environment using smart structures.

### ACCOMPLISHED

Through the combination of a comprehensive analysis and noise prediction code, it was shown that an on-blade device which can decrease blade washout can reduce the BVI noise level in front of the tiltrotor hub by as much as 6dB (see figure). A noise reduction strategy combining both on-blade deployment and nacelle tilt could reduce BVI noise levels by as much as 12dB. These noise reductions are consistent with NASA's 10- and 20-year goals and, if realized, could significantly accelerate the acceptance of tiltrotors into our national airspace system. In conjunction with this analytical work, various concepts were identified/considered to implement the blade twist changes called for. This work was conducted by Continuum Dynamics, Inc. (C.D.I) under NASA Small Business Innovative Research (SBIR) Phase I funding.

### FUTURE PLANS

Follow-on efforts have been proposed under SBIR Phase II. These include additional analytical efforts as well as hardware development and demonstration of the final concept on a model tiltrotor.