Visitor Research Report

Visitor Name:	**Professor Kenneth S. Brentner** **The Pennsylvania State University**
Area of Research:	**Prediction of Acoustic Scattering and Interaction for Shrouded Rotors**
Period of Visit:	**October 8, 2008 – June 30, 2009**
Period of Report	**October 8, 2008 – December 31, 2008**

Goal: Develop and demonstrate a new methodology for prediction of the combined noise generated by a rotor and the scattering from a shroud surrounding the rotor. In particular this research will study the noise from shrouded rotors where the length of the shroud is sufficiently short that duct propagation and duct acoustics is not applicable.

Strategy:
The proposed research will focus on the acoustic scattering of rotor noise by a shroud that surrounds the rotor. Three approaches will be used to predict this acoustic scattering:

1. compute the rotor aerodynamics with a traditional CFD code (including the presence of the shroud in the CFD computation), predict the noise of the rotor – using the load-ing computed by the CFD – with the noise prediction code PSU-WOPWOP (a.k.a. WOPWOP3), and then compute the scattered noise field with the NASA Fast Scatter-ing code;

2. compute the unsteady loading on the rotor blade AND the shroud with CFD, then compute the radiated noise for both the rotor and the duct using the PSU-WOPWOP code;

3. compute the unsteady flow field – including acoustics – with CFD out beyond the shroud, then compute the acoustic field with PSU-WOPWOP using a permeable acoustic data surface surrounding the entire shrouded rotor.

Accomplishments:
During this period, I have begun working with Doug Nark at NASA Langley on the acoustic scattering problem. In particular, access to the Fast Scattering Code v3.1 executable has been obtained and testing on simple geometries has been started. Also CFD computations (using Fluent) are underway to provide the flow field around a shrouded propeller that is being tested at Penn State.

Future Work:
Work is planned to predict the acoustic field of an isolated rotor in PSU-WOPWOP, along with the pressure gradient of the acoustic pressure, on the surface of the shroud –

which is the scattering body. Then the Fast Scattering Code v3.1 will be used to compute the scattered field. The combined noise will show the impact of the shroud. Noise computations are also planned to compute the noise directly from the CFD data on the propeller and the shroud.

Pending Publications: None yet

Seminar Presented: None to date