

**Department of Aerospace Engineering and Engineering Mechanics
College of Engineering
SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN**

APPLICATION DEADLINE: March 1, 2006

The Department of Aerospace Engineering and Engineering Mechanics is pleased to offer the following research project for the summer of 2006. Interested students are urged to contact the faculty member(s) directing the project that most interests them. By contacting the faculty member, you can discover more about the project, learn what your responsibilities will be and if possible, develop a timetable for the twelve-week research period.

Nondestructive Evaluation for Turbine Engine Hot Section Components

Professor Peter Nagy
Department of Aerospace Engineering and Engineering Mechanics
Office: 731 Rhodes
Phone: (513) 556 3353
Fax: (513) 556 5038
Email: peter.nagy@uc.edu
Website: <http://www.ase.uc.edu/people/info/nagy.html>

Project Description

It has been recently demonstrated that eddy current conductivity measurements can be exploited for near-surface residual stress assessment in surface-treated nickel-base superalloy components. In order to quantitatively assess the prevailing residual stress from eddy current conductivity measurements, the piezoresistivity coefficient of the material must be first determined using known external applied stresses. These calibration measurements are usually conducted on a reference specimen of the same material using cyclic uniaxial loads between 0.1 and 10 Hz, which is fast enough to produce adiabatic conditions. Recently, it was found that such dynamic calibration measurements should be corrected for the thermoelastic effect, which causes a perceivable temperature oscillation in the specimens and therefore distorts the calibration that should be really done under isothermal conditions. Experiments will be conducted on nickel-base superalloys under cyclic loading in an MTS load frame using a state-of-the-art FLIR Systems Thermovision SC6000 MWIR infrared camera to map the temporal variation and spatial distribution of the thermoelastic temperature oscillations. Combined with measurements of the temperature coefficient of the electric conductivity, these measurements will provide the necessary information needed to develop accurate thermoelastic corrections for the dynamic calibration data used in static residual stress assessment. This effort is part of a five-year collaborative research effort supported by the Air Force Research Laboratory.