DEPARTMENT OF AEROSPACE ENGINEERING
AND ENGINEERING MECHANICS
College of Engineering

SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: MARCH 1, 2004

The Department of Aerospace Engineering and Engineering Mechanics is pleased to offer the following research project(s) for the summer of 2004. 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 Characterization of Plastic Deformation in Nickel-Base Superalloys

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It has been found recently that, in contrast with most other materials, surface-treated nickel-base superalloys exhibit an apparent increase in electrical conductivity at increasing inspection frequencies, which can be exploited for nondestructive residual stress assessment of subsurface residual stresses. The primary reason why nickel-base superalloys, which are often used in the most critical gas-turbine engine components, lend themselves easily for eddy current residual stress assessment lies in their unique physical properties, namely that their electrical conductivity strongly increases under compression. The exact reason for this unusual behavior is presently unknown, but the role of magnetic contributions cannot be excluded and should be investigated. For example, it is well known that otherwise paramagnetic stainless steel alloys become slightly ferromagnetic at plastic strain levels between 10 and 50%. Similar data is needed in such popular nickel-base superalloys as IN100, IN718, and Waspaloy. The proposed task includes mechanical loading of the specimens in an MTS machine under precisely controlled conditions and subsequent testing of the magnetic properties with a SQUID (Superconductive QUantum Interference Device) scanner. This effort is part of a five-year research effort supported by the Department of Air Force conducted in close collaboration with the Air Force Research Laboratory.