bearings operating at high temperatures are an emerging technology making commercial inroads into several markets including aircraft auxiliary power units (APUs), microturbines, gas compressors and blowers, and turbochargers.

The general trend for foil bearings since their initial development over five decades ago is application to larger and more complex rotor systems. As this proliferation occurs, more practitioners will become actively involved with new machine development using foil bearings. Thus, there is a great need for application guidelines to establish the feasibility of proposed rotor systems and to identify existing machines that are good candidates for foil bearing use. Specifically, a method is needed to estimate foil bearing stiffness and damping behavior in order to foster advanced oil-free rotating machine development.

Methods to estimate critical stiffness and damping parameters, however, do not currently exist. The purpose of the methods put forth in this work is to establish simple tools capable of estimating foil bearing stiffness and damping coefficients suitable for oil-free rotor support design work. This has been accomplished by first coalescing all available empirical data on foil bearing performance that has been generated in the author's own laboratories, and by researchers working in university, government, and industrial laboratories. This information is examined and combined, then used to develop ROT for foil bearing stiffness and damping. These ROTs can then be combined with existing rules for load capacity to obtain credible feasibility assessments for proposed oil-free rotor systems.

The effort described has resulted in algebraic models for foil gas bearings that yield stiffness, damping, and load capacity values as a function of bearing size, design, and operating speed. With these models, one can easily determine the feasibility of building a foil bearing supported machine without incurring the expense of early experimental work. The models presented represent the only known and verified methods to predict conveniently foil bearing performance properties.

This work was done by Christopher DellaCorte of Glenn Research Center. Further information is contained in a TSP (see page 1).

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steven Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-18755-1.

Sampling and Reconstruction of the Pupil and Electric Field for Phase Retrieval

Goddard Space Flight Center, Greenbelt, Maryland

This technology is based on sampling considerations for a band-limited function, which has application to optical estimation generally, and to phase retrieval specifically. The analysis begins with the observation that the Fourier transform of an optical aperture function (pupil) can be implemented with minimal aliasing for Q values down to $Q = 1$. The sampling ratio, Q, is defined as the ratio of the sampling frequency to the band-limited cut-off frequency. The analytical results are given using a 1-d aperture function, and with the electric field defined by the band-limited sinc(x) function. Perfect reconstruction of the Fourier transform (electric field) is derived using the Whittaker-Shannon sampling theorem for $1<Q<2$.

The Fourier transform is constructed by periodic extension, i.e., by spacing copies of the transform in a definite way, recognizing that no aliasing occurs for values of the sampling ratio such that $1<Q<2$, which can be used to advantage in the application of phase retrieval estimation. A method was developed for propagating the electromagnetic field with no aliasing, which has been extended to 2-d optical apertures.

This work was done by Bruce Dean, Jeffrey Smith, and David Aronstein of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-15947-1

Space Operations Learning Center Facebook Application

This app uses the latest networking technology to inspire young audiences to be interested in math, science, and engineering.

Goddard Space Flight Center, Greenbelt, Maryland

The proposed Space Operations Learning Center (SOLC) Facebook module, initially code-named "Spaceville," is intended to be an educational online game utilizing the latest social networking technology to reach a broad audience base and inspire young audiences to be interested in math, science, and engineering.

Spaceville will be a Facebook application/game with the goal of combining learning with a fun game and social environment. The mission of the game is to build a scientific outpost on the Moon or Mars and expand the colony. Game activities include collecting resources, trading resources, completing simple science experiments, and building architectures such as laboratories, habitats, greenhouses, machine shops, etc. The player is awarded with points and achievement levels. The player's ability increases as his/her points and levels increase. A player can interact with other players using multiplayer Facebook functionality. As a result, a player can discover unexpected treasures through scientific missions, engineering, and working with others.

The player creates his/her own avatar with his/her selection of its unique appearance, and names the character. The player controls the avatar to perform activities such as collecting oxygen mole-