



DEPARTMENT OF MECHANICAL ENGINEERING Purdue School of Engineering and Technology

SPRING 2006 SEMINAR SERIES

Date: **Thursday, January 26, 2006**

Time: **11:00 am - 12:00 pm**

Room: **SL 165**

Reception at **10:45 am** (cookies and refreshments served)
Everyone is invited

Boosting Gas Turbine Energy Efficiency with Constant Volume Combustion

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Abstract. The gas turbine has been an enormously successful power plant for aircraft and marine propulsion, and electric power generation, due to its light weight, smooth and reliable operation, low emissions, and varied applications. Nevertheless, it is not very efficient in converting fuel energy to useful work, due to fundamental thermodynamic limitations imposed by turbomachinery technology. In recent years, there is renewed interest in the potential high efficiency of alternative thermodynamic cycles and unsteady combustion systems for propulsion and gas turbine applications, with pulse detonation engines and wave rotors receiving significant attention. While wave rotors have been mostly used as dynamic pressure exchangers in previous efforts, the achievement of nearly constant-volume combustion inside rotor channels is a relatively new goal, and has been experimentally and numerically investigated. Such a pressure-gain combustion device, known as the (internal) combustion wave rotor, should yield a higher cycle thermal efficiency than conventional constant-pressure combustors. This presentation provides an overview of the latest developments in the field of combustion wave rotors, highlighting the ongoing joint research effort between Rolls-Royce, IUPUI, and Purdue University to design, test, and commercialize the combustion wave rotor.

About the Speaker. Dr. Nalim is an Associate Professor at the Purdue School of Engineering and Technology in Indianapolis, where he has established a research program in unsteady flow devices including wave rotors and rotary pulse detonation engines. He was previously a member of the wave rotor team at the NASA Glenn Research Center, and has over 20 years of practical and analytical experience related to combustion engines and non-steady flow processes. Since 2000, Dr. Nalim has led a consortium of university and industry researchers to establish the Indiana Center of Excellence for Propulsion and Power. He has received four patents for new self-cooled wave rotor and rotary pulsed detonation propulsion concepts.