The George W. Woodruff School of Mechanical Engineering at Georgia Tech Presents The Annual Harold W. Gegenheimer Lecture Series on Innovation

Featuring:

Dr. Malcolm Swinbanks
Chief Scientist, Vibration and Sound Solutions, Ltd.

Speaking About:

From Mathematics to High-Speed Boats — A Shock to the System

Thursday, November 4, 2004, 3:30 P.M.
Van Leer (ECE) Auditorium
Georgia Tech Campus, Atlanta, Georgia

(Reception after the lecture on the 2nd floor of the J. Erskine Love Jr. Manufacturing Building)

Biographical Sketch

Dr. Malcolm Swinbanks has worked for 23 years as an engineering consultant through his UK Company, MAS Research Ltd. (Mathematical & Scientific Research) and, more recently, as Chief Scientist to the U.S. Company Vibration & Sound Solutions Ltd. of Alexandria, Virginia. Encouraged to study applied mathematics, he gained 1st class honors at Trinity College, Cambridge, in 1970, before taking his Ph.D. under Professor Sir James Lighthill, one of the foremost applied mathematicians of the 20th century. He addressed theoretically the control of distributed parameter systems, focusing on fluid mechanics and wave propagation, and in 1972 filed his first patent on active control of sound propagation in ducts. To broaden his skills in practical engineering, he worked as Marine Consultant Engineer for YARD Ltd (Yarrows Admiralty Research Department). Yarrows was a Scottish shipbuilder whose founder, Sir Alfred Yarrow, gave the first graphic demonstration of vibration cancellation in a torpedo boat, in 1892.

While he was addressing vibration isolation in naval ships, the National Research Development Corporation took up his patent, funding development of the first industrial active gas turbine exhaust silencer at Duxford, near Cambridge. Dr. Swinbanks returned to Cambridge University to lead this project successfully from 1979-1981, as Consultant to Topexpress Ltd.

He established MAS Research Ltd. to provide consultancy to the UK marine and aerospace industries. Rolls-Royce Aero Engines invited him to participate in their program for Active Control of Compressor Surge and Stall, resulting in the first successful demonstrations on a Viper jet engine in 1991. He worked for Douglas Aircraft and GEC Avionics on active silencing for propeller noise in aircraft cabins, and from 1990 collaborated with GEC Marconi Research on

Project M, an offshore DARPA research program in active vibration control. In 1995, the U.S. Congress requested that this project transfer to the United States. Vibration & Sound Solutions Limited (VSSL) was formed to provide the focus, and the work was successfully transitioned, leading to a one-quarterscale demonstration of a large-scale machinery installation in 2000. Subsequently, the Office of Naval Research asked VSSL to investigate potential application to mitigating shock for occupants of high-speed vessels. Present R&D is focused on bringing active and passive techniques to fruition in this context.

Dr. Swinbanks is inventor of 15 patents, with three pending.

Synopsis of the 2004 Gegenheimer Lecture

The techniques of active control applied to high-speed dynamical processes — Sound, Vibration, Combustion, Compressor Instability, and Shock — have brought the author into contact with a wide range of engineering research and development areas. This has provided first-hand experience of the overall process of invention, theoretical analysis, subsequent numerical and experimental validation, through to industrial application.

There are many factors that influence this process. While the statement "necessity is the mother of invention" may frequently be accurate, much innovation is initially motivated by curiosity, and a desire to establish what is achievable. Often, the consistent obstacle to progress is an intellectual barrier, which causes people to believe that the best has already been achieved. Removal of this barrier, and demonstration that there is opportunity beyond, can trigger developments in a manner that might initially never have been envisaged. Ultimately, there may be changes of direction, but this does not detract from the fact that without the initial innovation, such routes would never have been pursued.

Illustrations of this process will be given, ranging from low-speed ventilation ducts to high-speed aero-engine compressors, from vigorously vibrating ships to stealthy submarines, from actively silenced aircraft interiors to the pounding ride of high-speed navy craft in heavy seas. In the latter context, the severity can result in physical injury, and the mechanics of such injuries must be considered. The areas of technological improvement that have opened up these opportunities are multifaceted, and demonstrate the extent to which engineering research and development can provide a challenging, wide ranging, and stimulating career.

About the Lecture Series

The Lecture Series on Innovation was established in 1995 through an endowment from Mr. Harold W. Gegenheimer (Class of 1933) to support student programs that encourage creativity, innovation, and design. Through the lecture series and support of capstone design projects, students are exposed to processes that stimulate creativity and lead to inventions and patents. The previous Gegenheimer lecturers were:

1995	**Dr. Jerry M. Woodall**	Distinguished Professor of Microelectronics at Purdue University	*Necessity Is the Mother of Invention, But Curiosity and Persistence Make It Happen*
1996	**Mr. Burt Rutan**	President and CEO of Scaled Composites, Inc.	*Innovation: Use It or Lose It*

1997	**Dr. Jim Adams**	Professor at Stanford University	*Creativity Versus Control: Their Impact on Innovation*
1998	**Dr. George N. Hatsopoulos**	Founder of Thermo-Electron Corporation	*Thermo Electron and the Spin-Out Business Design*
1999	**Mr. Richard Teerlink**	Retired President and CEO of Harley Davidson, Inc.	*Our Learning Journey*
2000	**Dr. Woodie Flowers**	Pappalardo Professor of Mechanical Engineering at MIT	*Innovator, Innovatee, or Somewhere Between?*
2001	**Dr. Leo Beranek**	Co-Founder, Past President, and CEO of BBN	*Concert Halls of the World and Their Design*
2002	**Dr. Roger L. McCarthy**	Chairman of Exponent, Incorporated	*Engineering Disasters: Those who cannot remember [innovation's] past are condemned to repeat it.*
2003	**Dr. Steven L. Stice**	Professor and Eminent Scholar at the University of Georgia	*Cloning Technology at a Crossroad: Raelians or Real Science?*

About the Woodruff School

The Woodruff School of Mechanical Engineering is the oldest and second largest of the ten divisions in the College of Engineering at Georgia Tech. The School offers academic and research programs in mechanical engineering, nuclear and radiological engineering/medical physics, paper science and engineering, and bioengineering. The enrollment includes 1674 undergraduates and 696 graduate students. Studies are directed by a full-time staff of 72 professors, ten joint faculty, 23 research faculty, and five academic professionals, who are supported by 43 staff members. The George W. Woodruff School of Mechanical Engineering is the only educational institution to be designated a Mechanical Engineering Heritage Site by the American Society of Mechanical Engineers. For more information about the Woodruff School contact:

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