

ME DEPARTMENTAL SEMINAR

Friday, October 20, 2006

2:00pm – 3:00pm

2211 GG BROWN

**Professor Steven Ceccio
Mechanical Engineering
University of Michigan**

“Science and Engineering of Friction Drag Reduction on Ships”

Abstract:

For the past 5 years, our group at the University of Michigan has examined a variety of drag reduction methods that could be applied to ocean-going ships. Our effort has focused on micro-bubble drag reduction, polymer drag reduction, air-layer drag reduction, and partial-cavity drag reduction. We have conducted both laboratory-scale and large-scale experiments to understand the underlying flow processes responsible for the presence (or loss) of drag reduction, and to aid in the engineering evaluation of these methods. Moreover, we have partnered with a substantial group of researchers who have developed numerical models of these complex flows. Our high Reynolds number testing has been conducted on a large, near-zero pressure gradient flat-plate test model, the HIPLATE. And, experiments were conducted in the U. S. Navy's William B. Morgan Large Cavitation Channel, the largest variable-pressure low-turbulence water tunnel in the world. We have examined boundary layer flows of Re_x greater than 200 million ($Re_\theta > 150,000$) using a variety of instrumentation, including local skin friction measurements, micro-PLIF and micro-PIV for polymeric flows, and optical and electrical probes for the gas-liquid flows. In this talk I will present an overview of our findings regarding each drag reduction methodology, along with an assessment of its potential application to large-scale ships. I will also discuss our current tests on the roughened HIPLATE, and our experiment planned for this Fall and Winter to study air-layer and cavity drag reduction. This research effort is supported by the Office of Naval Research and the Defense Advanced Research Projects Agency.