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Drag Measurements over Embedded Cavities in a Low Reynolds Number Couette Flow[1] CALEB GILMER, University of Maryland, Baltimore County, AMY LANG, ROBERT JONES, University of Alabama — Recent research has revealed that thin-walled, embedded cavities in low Reynolds number flow have the potential to reduce the net viscous drag force acting on the surface. This reduction is due to the formation of embedded vortices allowing the outer flow to pass over the surface via a roller bearing effect. It is also hypothesized that the scales found on butterfly wings may act in a similar manner to cause a net increase in flying efficiency. In this experimental study, rectangular embedded cavities were designed as a means of successfully reducing the net drag across surfaces in a low Reynolds number flow. A Couette flow was generated via a rotating conveyor belt immersed in a tank of high viscosity mineral oil above which the plates with embedded cavities were placed. Drag induced on the plate models was measured using a force gauge and compared directly to measurements acquired over a flat plate. Various cavity aspect ratios and gap heights were tested in order to determine the conditions under which the greatest drag reductions occurred.

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