Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Airflow Actuation of Shortfin Mako Shark Denticles[1] SEAN DEVEY, PAUL HUBNER, AMY LANG, The University of Alabama — The shortfin mako shark is covered in microscopic scales called denticles, which may act as a mechanism for passive flow control. Recent research has investigated the theory that reversing flow could passively bristle these denticles, which could delay flow separation. Water tunnel studies have supported this theory, yet a wind tunnel study at a greater dynamic pressure found no significant differences between an airfoil covered with mako skin and a smooth airfoil. A likely cause is that surface tension between denticles, which must be wet to retain flexibility, prevented bristling. This would not be an issue in water. To determine what reverse airflow characteristics cause denticle bristling in air, a benchtop study was conducted in which a jet of air was impinged upon a sample of wet mako skin in the reverse flow direction. A microscope and camera captured video of the denticles under the air jet, and image analysis techniques were used to detect bristling. Analysis shows sporadic bristling around 16 m/s (q = 150 Pa) but full bristling does not occur until above 35 m/s (q = 740 Pa). The free stream velocities required to achieve such reversal speeds are much higher. For this reason, mechanical analogues will be used rather than real skin in future studies of this mechanism.

[1]Funding from Boeing and NSF REU site grant EEC 1358991 is greatly appreciated

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Date submitted: 28 Jul 2016 Electronic form version 1.4