Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

From Red Cells to Soft Porous Lubrication T. GACKA, CBMSS, R. NATHAN, L. WU, Q. WU, CBMSS LABORATORY TEAM, CHINESE ACADEMY OF SCI. TEAM — Feng and Weinbaum (*J. Fluid. Mech.*, **422**, 282, 2000), inspired by the enhanced lift phenomena in downhill skiing, developed a new lubrication theory for highly compressible porous media where significantly increased lifting force was predicted as a planing surface glided over a soft porous layer; suggesting superior potential use of porous media for soft lubrication. In this study, we experimentally examine the lift generation phenomena by developing a novel soft porous bearing that consists of a running conveyer belt covered with a soft, 100% polyester, porous sheet, and a stationary, fully instrumented, inclined, planar, upper board. Pore pressure was generated as the upper boundary glides over the soft porous bearing and was measured by pressure sensors. One observed that the pore pressure distribution is consistent with predictions by Feng and Weinbaum (2000), and is a function of the relative velocity between the planing surface and the running belt, the mechanical properties (e.g. porosity, permeability and stiffness) and thickness of the porous layer, as well as the compression ratios at the leading and trailing edges. A load cell is used to characterize the performance of the porous bearing, by comparing pore pressure to total lifting forces. The study presented herein significantly improves our understanding of the behavior of highly compressible porous media under fast compression.

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Date submitted: 09 Aug 2011 Electronic form version 1.4