Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Reflections Over Coupled Surfaces by Means of a High Resolution Setup MEITAL GEVA, OMRI RAM, OREN SADOT, Pearlstone Center for Aeronautical Engineering Studies, Ben-Gurion University, BEN-GURION UNIVERSITY OF THE NEGEV, ISREAL TEAM — The reflection patterns over two coupled cylindrical surfaces are studied using a high spatial and high temporal resolution experimental setup. This fully automated setup enabled the repetition of experiments many times while retaining extremely high repeatability. For the investigated moderate shock strengths, the repeatability was less than 0.01 in the Mach number. Each experiment produced a single image with a pixel size of 0.03 mm. All images were later sequentially merged generating a detailed description of a single reflection process. Unlike previous studies in which analysis was subject to human inconsistency, an automatic image processing procedure was used to locate the triple point in each image. The high resolution enabled the experimental detection of the early stages of Mach-reflection as were never demonstrated before. The experimental results were compared with numerical computation and a suitable uncertainty analysis was performed. The reflection over the first model enabled the transitions between MR→RR→MR. These successive transitions have proven the existence of a non-stationary hysteresis shock-wave reflection phenomenon. The reflection over the second model enabled the monitoring of the RR→MR transition and the evolution of a newly three-shock configuration established on the Mach stem of the original reflection (MRMR). It was found that the MRMR→MRRR transition angles could be adjusted to match those obtained over a single cylinder.

Meital Geva
Pearlstone Center for Aeronautical Engineering Studies, Ben-Gurion University

Date submitted: 29 Jul 2015 Electronic form version 1.4