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Unsteadiness of a shock train in Mach 2.0 flow ROBIN HUNT, JAMES DRISCOLL, MIRKO GAMBA, University of Michigan — Experimental observations of the progression of flow unsteadiness within a shock train are presented. A downstream control valve is used to generate a shock train in the constant area test section of a wind tunnel with a freestream Mach number of 2.0. Even with nominally constant boundary conditions the shock train exhibits inherent unsteady motion about the time average position. At the conditions presented the shocks can be displaced by up to 0.35 duct heights. Better knowledge of the shock train's dynamics may allow us to introduce control algorithms to reduce the system's unsteadiness and thus minimize the associated mechanical and thermal loads. An edge detection algorithm is applied to the instantaneous frames of high speed Schlieren movies to track the location of morphological features within the shock system. Simultaneously, high speed pressure transducers record the pressure fluctuations along the bottom wall of the duct. The results indicate a complex frequency dependent dynamical system. A strong component of the dynamics involves a disturbance traveling upstream through the boundary layer. Once the disturbance reaches the leading shock foot the shocks respond in order with the most upstream shock moving first.

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