Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Self-Excited Shock Train Dynamics in a Mach 2 Isolator MIRKO GAMBA, ROBIN HUNT, JAMES DRISCOLL, Univ of Michigan - Ann Arbor — A shock train is the complex system of shock waves that forms in a supersonic ducted flow when the back pressure is raised, and it is typically found in the isolator of air-breathing, high-speed systems. Its formation is due to a balance of the inviscid action of a system of shocks in the core of the flow and the viscous effects at walls. Although the typical description and understanding of shock trains is limited to its steady state behavior, a shock train exhibits significant dynamics, most of which are self-excited, even under nominally constant inflow and outflow conditions. Here we evaluate some of the dynamical properties of a shock train generated in a Mach 2.0 ducted flow.Cross-spectral analysis of pressure and shock position fluctuations are used to identify a complex, frequency dependent system of perturbations that affects the unsteady motion of the shock train. Specifically, we have identified two paths of propagation of perturbations that are associated with two different sources, one associated with the regions of separated flow and one external to the shock train, that affect the steadiness of the shock train, thus partially explaining the observed shock train inherent unsteadiness.

Mirko Gamba
Univ of Michigan - Ann Arbor

Date submitted: 04 Aug 2017 Electronic form version 1.4