Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Geometric Modifications to Complex Supersonic Nozzle Configurations Guided by Machine Learning[1] SETH KELLY, EMMA GIST, MARK GLAUSER, Syracuse University — This study focuses on a Multi Aperture Rectangular Single Expansion Ramp Nozzle. A MARS configuration consists of a core and bypass flow separated by a splitter plate that exits onto an aft deck on one side, mimicking a nozzle integrated into an air frame. In an effort to implement passive control to the system via geometric modifications, two highly receptive regions have been identified by way of simulation and experiment: the splitter plate trailing edge and the aft deck. Modifying the aft deck is the primary area of focus in this study. Changes are made to the aft deck trailing edge (ADTE), deck length, and width. An Artificial Neural Network is used to predict sound pressure levels for decks with varying lengths over a range of operating conditions to determine a minimum noise case, as well as create an acoustic model for a variable deck length. Particle Image Velocimetry (PIV) measurements at the deck trailing edge guide the implementation of various modifications to the ADTE. All aft deck changes are tested experimentally for two splitter plates, a nominal case and one in which a wave number has been introduced to the trailing edge. Near and far field pressure probes, as well as PIV act as the measurements used to identify differences among the configurations tested.

[1]This study was provided funding by the Air Force Office of Scientific Research (AFOSR) grant number FA9550-19-1-0081, Dr. Gregg Abate, program manager.

Seth Kelly
Syracuse University

Date submitted: 31 Jul 2020 Electronic form version 1.4