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Cavities in Deck Plate for a Rectangular Supersonic Multi-Stream Jet Nozzle[1] RISHOV CHATTERJEE, SETH KELLY, EMMA GIST, MARK GLAUSER, Syracuse University — Minimizing overall sound pressure levels (OASPL) when dealing with supersonic flow has been a key goal at Skytop Turbulence Laboratory. If the shock structure occurring from supersonic flow is dissipated more rapidly by using surface modifications (cavities), OASPL may decrease as a result. One stream of the jet in the MARS (Multi Aperture Rectangular Single Expansion Ramp Nozzle) is capable of reaching supersonic speeds, with the mainstream reaching speeds of Mach 1.6 and the bypass stream reaching speeds of Mach 1. The streams exit onto a deck plate (to simulate air frame integration) and through particle image velocimetry (PIV), the different shock structures and shear layers can be identified. Current literature suggests cavities on the aft-deck can act as a passive control to alter the shock structure and the acoustics in channel flow. Testing out this form of passive control located in an open loop flow to see if the OASPL can be reduced will build up on the current research. The surface of nominal deck plates were modified using various cavities of different geometries in order to see how the sound pressure level is impacted. To validate its effectiveness, this data is tested against a nominal plate with no surface modifications using near and far field accoustics.

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