Restoration of the National Aerothermochemistry Laboratory Plasma Facility

Alexander A. Soderlund¹
The University of Texas at Austin, Austin, TX, 78712

This report details the redesign, reconstruction, and calibration of the Decaying Mesh Turbulence (DMT) Plasma Facility at the National Aerothermochemistry Laboratory. The integral parts of the old tunnel were combined with new parts to give the facility a smaller frame, thus making it more accessible and easier to perform various flow visualization tests such as Particle Image Velocimetry (PIV), Schlieren photography, and most importantly vibrational non-equilibrium tests via plasma electrodes, which is the main focus of the facility. The previous DMT plasma facility attempted to associate the rate at which turbulence decays with the rate at which an excited molecule approaches relaxation. Preliminary tests run on the new plasma facility show distinctive velocity, pressure, and boundary layer variations that correlate with theoretical plotlines derived from Bernoulli’s principle and the Law of Conservation of Mass. Eventually, the DMT plasma facility is planned to incorporate the Vibrationally Excited Nitric Oxide Monitoring technique, which will allow further research into the 3-D modeling of the velocity and temperature vectors of an excited NO molecule.

¹ Insert Job Title, Department Name, Address-Mail Stop, and AIAA Member Grade (if any) for first author.