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Experimental Testing of the T-NSTAP in Supersonic Flow[1]
KATHERINE KOKMANIAN, MARCUS HULTMARK, Princeton University — A fast response nanoscale temperature sensor (T-NSTAP) was developed at Princeton University. This novel sensor has been shown to increase both the spatial and the temporal resolutions compared to conventional cold-wire probes, due to its large aspect ratio yet small overall size (100 nm x 2 μm x 200 μm). The T-NSTAP has been tested in various subsonic facilities, however it has not yet been tested under supersonic conditions. Here we will present the first measurements from supersonic flows using the T-NSTAP in Princeton's Low Turbulence Variable Geometry Facility at Mach 3 and later in Princeton's Hypersonic Boundary Layer Facility (HBLF) at Mach 8 in order to enable unfiltered data of the temperature field in high speed flows. Since the HBLF can generate more challenging conditions than these probes have previously been tested in, our attention will be focused on ensuring that the T-NSTAP can withstand these conditions. Assuming that a shock will form at the front edge of the sensor, the total force on the T-NSTAP was calculated to be on the order of μN, which is less than when it was tested in subsonic pressurized conditions. Investigations will be undertaken to ensure that the structural and electrical properties of the sensors are maintained during the tests.

[1]Air Force Office of Scientific Research (AFOSR)

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