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Plasma Sensor Suite ERIC MATLIS, PATRICK BOWLES, THOMAS CORKE, University of Notre Dame — Progress has been made towards the development of a new class of sensors which have the potential to overcome the temperature limitations found in conventional sensors, thus addressing an important measurement challenge faced in the measurement of high speed flows. The new approach is based on the a.c.-driven mass-flow laboratory plasma anemometer developed by Matlis et al. and uses a weakly ionized glow discharge encapsulated between two electrodes as the sensing element. These sensors will feature proven elements of the technology used in the plasma anemometer, but will be extended for high-temperature, multiparameter operation. The sensitivity to different parameters can be provided by the design and orientation of the electrodes. The objective is to replace conventional sensors which provide diagnostics in the laboratory but are known to fail in real-world applications with a suite of rugged sensors optimized to measure wall shear-stress, pressure, temperature, heat flux, mass-flow, strain, and gas species. The advantages of the plasma sensor are that it has no mechanical parts (like a pressure transducer diaphragm) to fatigue or break, its operation is insensitive to temperature, it has a very high frequency response (2MHz +), and its output can be received wirelessly. These advantages over other sensors makes it ideal for use in high speed flows.

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