**Abstract**

**Air travel has become considerably safe in the last decades, yet we see some fatal accidents. Some recent incidents reveal that there are issues in the measurement of wind speed and angle of attack (AoA). This paper presents a novel system for concurrently sensing the wind speed and AoA of an aircraft. We present the design of a wireless sensor, called Hermes, that simultaneously enables sensing as well as piezoelectric energy harvesting, making it self-powered and batteryless. Hermes comprises of a set of piezoelectric films which flutter due to incoming wind speed, and the characteristic of this aeroelastic flutter is utilized for determining the wind speed and AoA of the incoming airflow. The design of Hermes is such that sensing performance and energy harvesting capability are simultaneously maximized, with- out the need for trading off.**

**Hermes, a small form factor electronic module along with piezoelectric films and a 3D mount, is fabricated, tested in a wind tunnel, and in a real aircraft fuselage for its communication performance. Hermes harvests an average power of 440 휇W power. Over a wide range of AoA of −10 to 30 degrees, the estimation of the wind speed is within 0.2 m/s error with 90% probability and AoA error is within 1.2 degree with 90% probability. Hermes can be used in light aircraft and long endurance UAVs as is. It can also be used in several other applications, such as windmills. Hermes is expected to open up new avenues for interdisciplinary research for aerospace applications.**