

US Navy awards MicroStrain, Inc. \$750,000 to develop energy harvesting wireless sensors for helicopter damage tracking

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Williston, Vermont, July 11, 2006 - The US Navy (NAVAIR) has recently (June 13th, 2006) awarded MicroStrain, Inc. an SBIR Phase II contract to develop next generation wireless strain sensors for damage tracking of Navy helicopters. MicroStrain's patent pending sensing systems will operate indefinitely on rotating helicopter components without the need for battery maintenance, by converting the component's cyclic strains into DC power using piezoelectric materials.

MicroStrain's miniaturized, programmable systems serve a range of vehicle health management functions, including: embedded test & evaluation (ET&E), health usage monitoring (HUMS), and structural health monitoring (SHM). Phase I demonstrations proved that MicroStrain's nodes will operate continually, without battery maintenance, even under low energy generation conditions of straight and level helicopter flight. By continuously monitoring the strains on rotating components, the nodes can record operational loads, compute metal fatigue, and estimate remaining component life. Data compression and fatigue algorithms are fully embedded in the nodes, and the strain vs. number of cycles (S-N) curve may be wirelessly uploaded to suit the application's specific materials and geometries.

Reducing power consumption is a critical requirement for energy harvesting, because the energy "checkbook" must be balanced to support continuous operation. MicroStrain's engineers have recently published power consumption reductions that are eye-popping. In recent Navy demonstrations, MicroStrain's new wireless sensor nodes (strain gauges sampled at 40 times/sec, and with 70 meters wireless communications range), provided significant power savings: from the standard 72 milliwatts, down to only 0.9 milliwatts – an improvement of 80 times!

The helicopter pitch link was selected as the rotating structure for demonstrations during MicroStrain's Phase I SBIR. The pitch link is a critical rotating element that adjusts the rotor blade's angle of attack as the rotor turns through the air. Pitch link loads depend strongly on flight regime, therefore, these loads are an indicator of structural usage severity. In tests replicating light usage (straight & level flight) - MicroStrain's energy harvesters generated ~1 milliwatt. During tests replicating heavy usage (pull-ups, gunnery turns), the harvesters generated ~5 milliwatts. These demonstrations proved that a practical wireless damage tracking system could be operated indefinitely without batteries, under a wide range of operating conditions.

"We're excited to be selected by the Navy to advance our energy harvesting wireless sensing systems for aircraft uses. This new round of SBIR funding complements our current work in Navy shipboard applications. Our embedded power management, data compression, and fatigue monitoring methods are leading innovations. And the elimination of battery maintenance breaks down a major barrier to the wide implementation of wireless sensing networks.

Our new wireless, battery free sensing nodes significantly enhance safety and reduce operating costs of military, automotive, and aerospace machines and structures”, said Steven Arms, President of MicroStrain, Inc.

The Navy SBIR Phase II award provides ~\$750K over a two year period. Combined with Phase I, US Navy support totals ~ \$900K. The Federal SBIR program is highly competitive, and funds only those small businesses innovations with significant commercial potential. More information on the Navy’s SBIR program is available on-line at www.navysbir.com.

MicroStrain, Inc. is a leading designer and manufacturer of next generation wired & wireless networks for embedded displacement, strain, vibration, temperature and orientation sensing. For further information please visit MicroStrain’s website at www.microstrain.com or call 802-862-6629.

**Helicopter Pitch Link
w/ Energy Harvesting,
Sensing, Data
Storage, & Wireless
Communications**

(MicroStrain, Inc. patents pending)

- RF antenna
- Circuit board module,
microprocessor, and
electrochemical
battery
- Piezoresistive strain
gauge
- Piezoelectric energy
harvesting elements
- Electrical insulation,
EMI shielding,
& protective covering



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