

1. **Research Title:** “An Integrated Location and Physiology Monitoring and Processing System.”

2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** Electrical Engineering and Computer Science/Multi-sensor integration and processing (MS or Ph.D. level)

4. **Description:** The proposed project will develop an integrated location and physiology monitoring, processing prototype system consisting of multi-element physiological sensors, GPS receivers, microprocessors, radio transceivers, data storage functions, and software that supports sensor data collection, multiplexing, analysis, transmission, storage, and user feedback. Such a system may fulfill a critical role for military and civilian personnel, such as pilots, special operation troops, fire fighters, and other personnel operating under hostile conditions.

Physiological sensors along with portable navigation equipment will provide a user’s real time physiological and location information. The information will be converted and multiplexed to form a digitized stream and are inputs to an embedded microprocessor. The processor will perform the following functions: (1) write the input stream to a USB storage device, (2) transmit the input data stream to a base station via an on-board spread spectrum radio transmitter. A PC-based base station will be established to receive and process the transmitted signals.

Navigational sensors, such as inertial navigation sensor and/or small source-less magnetic sensors, could also be incorporated into the system to provide alternative navigation capabilities if GPS signal were compromised. New coding and modulation schemes will be studied and applied to signal transmission for enhanced security and anti-jamming capability. In addition to the data storage and transmission tasks, the embedded processor will also carry out signal processing of the user inputs and provides real time feedback to the user of his/her condition and location information. Advanced signal processing at the base station will also be carried out.

5. **Objectives:** (1) Complete a working prototype of an integrated sensor system consisting of sensors for measuring body temperature, perspiration, and ECG, and a GPS receiver. (2) Develop the data acquisition and multiplexing system that streamlines the integrated sensor inputs for transmission, storage, and processing. (3) Complete the implementation of the embedded processor host controller for the integrated system. (4) Develop a user monitoring and interface station for real-time data viewing and storage.

6. **Research Classification/Restrictions:** None at this time.

7. **Eligible Institutions:** DAGSI