RH19-7

Attachment 1 – DAGSI Research Topic Template

NOTE: Under the Cooperative Agreement, Technical Directorates have three options for topics. First, a topic can strictly be considered in the pool for the state allocation of funding. DASI will work across the TDs for this allocation. Second, the TD can be prepared to be a funding partner with the State of Ohio. This would include: providing additional funds to support additional recipients of a topic, or expand the proposers team to include additional members on a topic. Third, the TD may elect to fully fund a topic not selected for State of Ohio funding or to pursue University teams outside the State of Ohio. Contact Michael.hitchcock.3@us.af.mil for questions

1. **Research Title:** Develop, Test, and Validate Biomarker Sensors
2. **Individual Sponsor:** List the AFRL research topic sponsor's contact information

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3. **Academic Area/Field and Education Level**

   Electrical Engineering, Biomedical Engineering, or Chemical Engineering/Electronic, Electrochemical, Optical Biomarker Sensor Development and Platform Miniaturization
   BS Level
   Previous work with chem/bio sensors, microfluidics, and labview/C-coding are strongly desirable.

4. **Objectives:** 1) Develop chemical/biochemical sensing platform based on commercial off the shelf devices and/or their reengineered version, and/or newly designed receptors/materials; 2) Integrate microfluidics for evaluating the sensors at operation-relavant settings; 3) Interface the sensor to a variety of flexible/wearable electronic systems; 4) Evaluate and validate the sensors; and 5) Explore effective signal processing from multiplexed sensors.
5. **Description:** Molecular biomarkers indicative of human physiological and psychological status vary person-to-person and the measurement point of the time. Developing personal chemical and biochemical sensors that enable the profiling/reporting biomarker data throughout 8-24hr time frame of individual operators will greatly benefit USAF personnel health and performance. Zero footprint, noiseless, and low-powered sensing platform without the need for calibration and drift correction is highly desirable in developing a wearable or attachable personal sensor suite. Miniaturizing device size and increasing sensitivity and selectivity of chemical/biochemical/optical sensors are key elements in building such sensor suites. In this research, the structural interactions and functionalities of nano device platform and biomolecule hybrids are systematically probed by using both experiments and computations. The hybrid system is further explored for its capability as a sensor for the target of interest. The sample collection, delivery, signal processing, and device-to-device communication for the

miniaturized sensors and devices are to be explored collaboratively with both internal and external partners.

6. **Research Classification/Restrictions:** Unclassified/Unrestricted
7. **Eligible Research Institutions:** DAGSI: Wright State U, University of Dayton, University of Cincinnati, AFIT, Ohio State U, Ohio U