

FY15 Student Research Topic

1. **Research Title:** Develop, Test, and Validate Molecular Signature Chemical Sensors
2. **Individual Sponsor:**

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

Electrical Engineering and Computer Science/Sensor Signal Development and Platform Miniaturization
BS Level
Previous work with gas sensors, coding, Labview software, and dynamics modeling is strongly desirable.

4. **Objectives:** The objectives of this research include; 1) developing chemical/biochemical sensing platform based on commercial off the shelf devices and/or their reengineered version, and/or newly designed receptors/materials; 2) assisting in modifications of a fully functioning altitude chamber for evaluating various gaseous compound sensors; 3) interfacing the chamber with a variety of peripheral electronic systems; 4) testing these sensors in altitudes ranging from 1000 to 60000 feet; 5) signal processing from multiplexed sensor signals; and 6) assembling and aiding in the miniaturization of the best sensors and their corresponding integrated circuits into a flexible and/or flyable form factor.
5. **Description:** Multiple systems exist that provide feedback on the status of aircraft systems to pilots and ground crews. Few systems on the other hand monitor the health of the operator and what they may be exposed to. While a suite of commercial off the shelf (COTS) sensors exist to detect and quantify few compounds of toxicological relevance, the demand to incorporate them into a form factor that would readily plug into the aircrew protection requires retrofitting/reengineering of the COTS. New sensor design, material, and electronic interface should be developed to fill the gap where COTS are not existing for a known or to-be-known target. Moreover, little to no research has focused on the effects of altitude on these sensors hindering their viability to be integrated on to an airman protection system. An in-house built altitude chamber is being used to test affordable and optimized COTS products at airforce relevant environments. This allows us to trouble shoot many altitude associated problems before flight testing and certification commences. We can thus address these issues in a controlled laboratory environment in close proximity to the appropriate equipment required to modify them. Overall objective sought is the fabrication of laboratory demonstration prototype orthogonal/multi-modal sensors for determination of breathing air quality in military aircraft.
6. **Research Classification/Restrictions:** Unclassified/Unrestricted
7. **Eligible Research Institutions (check all that apply):**

DAGSI (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati)

Topic can be submitted for public release

AFIT (only)

USAFA (only)

If you are submitting a topic for the USAFA, indicate if you are also interested in sponsoring a USAF Cadet in summer 2015 (Average cost for USAF Cadet for 33 days is \$5000)

Yes

No

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88ABW-2016-3806