RY15-9

1. **Research Title:** Vehicle Vibration Signature Exploitation Study
2. **Individual Sponsor:**

Dr. Karmon M. Vongsy, AFRL/RYAT
AFRL/RYAT Bldg 620
2241 Avionics Circle
WPAFB, OH 45433-7321
karmon.vongsy@us.af.mil

3. **Academic Area/Field and Education Level:** Signal processing, laser vibrometry/ mechanical, electrical engineering and operations research (MS or Ph.D. level)
4. **Objectives:** Analyze detection performance based on sensor operating conditions.
5. **Description:** Aided Target Recognition (AiTR) algorithm performance is sensitive to variability in the observed target signature. Algorithms are developed and tested under a specific set of operating conditions (OCs) and then are often required to perform well under very different conditions. The stability of the target signature as the OCs change dictates the success or failure of the recognition algorithm. Laser vibrometry is a promising sensor modality for vehicle identification. Identifying vehicle features such as engine type, speed, and number of cylinders from vibrometry data provides significant context in a variety of commercial and military applications. The AiTR task is to analyze the vibration spectral signature to determine what type of vibration sources the vehicle contains, thereby identifying the vehicle type. In many cases, potential targets can be reliably identified by their engine vibration signatures. This topic seeks to develop a trade study of AiTR algorithms as a function of target characteristics and sensor parameters to enable the researcher a better understanding of the constraints on detection performance. Thus, rather than exploiting the vibration signatures independent of phenomenology parameters , the proposed exploitation research would incorporate information pertaining to the OCs to develop a better understanding of the limitations of the exploitation system.
6. **Research Classification/Restrictions:** Research could be Unclassified, FOUO or ITAR depending on approach and AFRL support
7. **Eligible Research Institutions:** Indicate to what organizations this topic should be provided

[X] **DAGSI** (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati) NOTE: Topics submitted to DAGSI must be approved for public release. Need PA Approval #

[X] **AFIT** (only)

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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 [X] No