

RY15-6

## Attachment 1 – Research Topic

1. **Research Title:** Exploring salient features for automatic target recognition (ATR) in future radar systems.

2. **Individual Sponsor:** List the AFRL research topic sponsor's contact information

Dr. Paul Sotirelis, AFRL/RYP  
AFRL/RYP Bldg 620  
2241 Avionics Circle  
WPAFB, OH 45433  
[Paul.Sotirelis@us.af.mil](mailto:Paul.Sotirelis@us.af.mil)

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

Electrical Engineering, Physics, or Mathematics (MS or PhD level)

4. **Objectives:** The objective is to develop effective algorithms for use in future ATR sensing systems that are able to extract, identify, characterize, and predict the features most salient to ATR. This includes algorithms that establish confidence bounds associated with system, target, and scenario uncertainties. Future sensing concepts include bi-static and multi-static scenarios.

5. **Description:** New methods for feature extraction and classification will be explored to improve radar ATR. The following areas are of interest.

- (1) Exploit feature phenomenology through choice of frequency (e.g. UHF through Ku), efficient use of bandwidth, unconventional waveforms, and/or multiple polarimetric channels.
- (2) Use of bi-static and multi-static data, or mono-static data that has the potential to be extended to the bi-static and multi-static case.
- (3) Provide quantitative measures of confidence as a function of sensor system, object, and scenario uncertainty parameters throughout the feature classification process.
- (4) Explore the degree of robustness to phase error and noise.
- (5) Strengthen the connection between the physical and ATR feature space domain.
- (6) Explore novel compact feature representations.

6. **Research Classification/Restrictions:** This research may be unclassified, FOUO, or classified. Unclassified research results may be FOUO and subject to ITAR restrictions. AFRL/RYP can work with advisor and student to develop results that can be published in the open literature

7. **Eligible Research Institutions:** Indicate to what organizations this topic should be provided



**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 #



**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