

## Attachment 1 – Research Topic Template

1. **Research Title:** Microstructure Characterization and Correlation of Processing-Structure-Geometry Relationships of Additively Manufactured Material.
2. **Individual Sponsor:**

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3. **Academic Area/Field and Education Level:** *Materials Science and Engineering, Physical Metallurgy and Microstructure Characterization (Masters or Ph.D. level)*
4. **Objectives:** *The objective of this research is to develop relationships among AM process conditions, build geometries and the resultant as-built microstructures.*
5. **Description:** *This project will perform characterization of microstructure, including evaluation of defect structure and non-traditional microstructural features, for a range of provided canonical shapes built from metallic powder-bed additive manufacturing processes using a broad range of process variables. Multi-variate analyses of the effect of dozens of processing conditions and simplified geometrical changes on resultant quantitative microstructure attributes is anticipated. Advanced characterization and analytical approaches (such as 3D microscopy, compressed sensing, machine learning, and neural network modeling) should be considered to efficiently and comprehensively interrogate these effects on local microstructure. Conventional microstructural information will be determined and analyzed using various analytical tools, including optical and electron microscopy. Particular emphasis will be placed on associating local process variables to the kinetics and thermodynamics to explain the resultant microstructure.*
6. **Research Classification/Restrictions:** *There are no anticipated restrictions for this research.*
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)  
PA Approval #: 88ABW-2015-3391 (internal: RX-15-0679)
  - AFIT (only)
  - USAFA (only)
 

If you are submitting a topic for the USAFA, please indicate if you are also interested in sponsoring a USAF Cadet in summer of 2013 (Avg Cost for USAF Cadet for 33 days was \$5000)

Yes    No