1. **Research Title:** Efficient Small-Scale Propulsion and Power Systems
2. **Individual Sponsor:**

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

   Engineering Physics, Applied Physics, Mechanical Engineering, Aerospace Engineering,  
   Chemical Engineering, Electrical Engineering (MS and/or PhD level)

4. **Objectives:** The proposed thesis topic aims to advance the state-of-the-art in small-scale  
   propulsion and power systems, utilizing advanced technology to achieve improvements in  
   efficiency, power density, and operability.

5. **Description:** Emerging propulsion and power needs drive combustion systems towards higher  
   efficiencies and power densities. New approaches are being developed in small-scale systems  
   (on the order of tenths to hundreds of kilowatts). Efficient small-scale propulsion and power  
   research has focused on the coupling of combustion heat release into useful energy conversion.  
   Research has included optimization of small-scale unmanned aerial vehicle propulsion and  
   power systems, including conversion of Otto cycle (spark ignition) engines to heavy fuels,  
   advanced ignition systems, propeller/engine optimization, and development of enabling  
   components and engine concepts for high power density systems. Small-scale demonstrations  
   of advanced turbine concepts are also currently being explored including innovative cycles.  
   Other areas of interest include hybrid systems, Diesels with high power density, regenerative  
   and other novel internal and external combustion cycles. A wide variety of research  
   opportunities are available utilizing the Small Engine Research Laboratory, including high speed  
   instrumentation (up to 5 MHz per channel), AVL INDI SMART combustion analyzers, high speed  
   imaging (up to 100,000fps), laser diagnostics, computational tools, and research engines.  
   Recent projects have included plasma ignition studies, engine combustion research using  
   alternative/bio fuels, hybrid propulsion/power systems, and novel Brayton-based cycles.

6. **Research Classification/Restrictions:** Most aspects of this research fall under the 6.1 basic  
   research classification. However, some aspects and the Small Engine Research Laboratory at  
   Wright-Patterson AFB are FOUO with export control/ITAR restrictions.

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