1. **Research Title:** Solid Oxide Fuels for Military Applications
2. **Individual Sponsor:** Dr. Thomas L. Reitz, AFRL/PRPS,
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3. **Academic Area/Field and Education Level:** Chemical and Materials Engineering / electrochemistry, catalysis, ceramic processing, high-temperature materials, modeling/simulation (MS or Ph.D. level)
4. **Objectives:** Because of their high efficiency and low signatures, fuel cells are a highly promising power system technology which could enable critical long endurance, military-critical missions. Furthermore, because they have few moving parts, the projected costs of maintaining these systems are expected to be far less than internal combustion engines. The Department of Energy has been investigating these technologies for domestic applications but the emphasis of these approaches is on achieving low cost, high duty power units for centralized power generation. The performance requirements of defense applications, by contrast, are significantly more demanding mandating the research and development of high performance fuel cell systems. The objective of this effort is to explore materials and technologies for significantly improving the performance of fuel cell technology for defense related applications.
5. **Description:** The goal of this 3-year DAGSI project is to investigate methods for significantly increasing the power density and military fuel compatibility of solid oxide fuel cells. The Air Force Research Laboratory is actively developing alternative anode formulations which facilitate the utilization of complex hydrocarbon fuels within the fuel cell electrode. DAGSI researchers will assist the AFRL in examining direct and indirect methods of JP-8, and related hydrocarbon fuel, electrochemical conversions. Alternative anode compositions will be examined in order to investigate catalytic and ion conductive agents which promote fuel conversion while suppressing carbon deposition. Conventional SOFC construction methods require extremely high temperature processing which significantly restrict the material sets available for use. DAGSI researchers will work with AFRL to investigate alternative cell construction methods to expand upon these materials. Novel approaches are currently being investigated which reduce the impedances associated with conventional laminar method for preparing SOFCs. DAGSI Scholars are our sought in the areas of electro/heterogeneous catalysis, ion/electron conductors, interfacial science, and metal-ceramic structures for high temperature ceramic-based fuel cells.
6. **Research Classification/Restrictions:** This research topic is open literature. However, in order to facilitate a strong cooperative relationship between WPAFB and the student, frequent travel onto the base will be required. As such the student must be a Permanent Resident of the United States or an American citizen.
7. **Eligible Research Institutions:**

[X] Universities (DAGSI) [X] AFIT [X] USAFA