

Research Development Fund – Spring 2020 Application

Application Title: High-Pressure Propulsion Laboratory for Fundamental and Applied Research in Hypersonic Propulsion, Rocket Propulsion, Gas Turbines, Power Generation, and Energetic Materials

Lead contact for RDF Application:

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Key Participating Units: College of Engineering (Mechanical, Aerospace, Chemical) | College of Science (Physics, Chemistry) | College of Geosciences (Atmospheric Sciences) | College of Agriculture & Life Sciences (Biological and Agricultural Engineering) | TEES | TEES Turbomachinery Laboratory | Mary Kay O'Connor Process Safety Center

Anticipated Request Amount (\$): \$2,810,250

Executive summary of this application to utilize Research Development Funds:

Over the past several years, Texas A&M University has assembled a critical mass of faculty members who have complementary research programs in propulsion, energetics, high-speed gas dynamics, power generation, and reacting flows. State-of-the-art research in these areas, both fundamental and applied, requires the ability to reproduce conditions in extreme environments: high pressures, high temperatures, high speeds, and high energy. One aspect that is lacking at TAMU but would make the university an unparalleled international leader in this area is a dedicated building to safely perform experiments that require a semi-remote location with unique test facilities and sophisticated instrumentation. To this end, we propose herein the establishment of the Propulsion & Energetics Research Laboratory, or PERL. This undertaking will provide the infrastructure that allows multidisciplinary research to be performed for important defense, energy, and homeland security technologies for many decades beyond the careers of the core proposal team. This core team of investigators across several departments, colleges, and centers will be the first creators and users of the PERL (i.e., Mechanical Engineering, Aerospace Engineering, Chemical Engineering, Chemistry, Geosciences, Atmospheric Sciences, Physics, Biological and Agricultural Engineering, TEES, the Turbomachinery Laboratory, and Mary Kay O'Connor Process Safety Center). The new resources under this RDF will extend A&M's capabilities to include the operation of high-pressure, moderate-scale test rigs and the ability to safely study controlled combustion, rotating machinery, explosion, and detonation events at a location where detailed measurements using advanced optical diagnostics and spectroscopy can be applied. Arguably, only one other university in the nation has a similar capability, but combined with A&M's other, related strengths such as the Bush Combat Development Center and the National Aerothermochemistry and Hypersonics Lab, the PERL would give TAMU a singular advantage over any other university. The PERL satisfies a critical niche between the fundamental, detailed work that a university can do and the full-scale testing that only major government laboratories can perform. The core team of PIs and many other, related faculty will be able to leverage the PERL capability toward the pursuit of major grants from a wide range of government and industry sources in areas ranging from defense, homeland security, and process safety to energy, transportation, and space exploration. The requested funds are to primarily provide the major building- and experiment-related equipment that will make the PERL a working facility in as little as two years from breaking ground. The plan for management and sustainability of the PERL includes a dedicated facility director, a technician, and the sharing of other resources and management details under the TEES Turbomachinery Laboratory, of which Dr. Petersen is the Director. *If this RDF proposal is funded, TEES will support the construction of the expanded space to house the new equipment that is proposed to be purchased by the RDF. The new capability to be realized by the multidisciplinary RDF proposal team will be essential for DOE and DOD research in the areas of hypersonics, energy, and national security.*