Innovation/Company Details:
Title/Name of Technology: Aeroplastic, New Composite Materials with Reduced Heat Transfer and Increased Flame Retardancy

Technology Summary: A new composite system formulated using commodity grade and engineered grade polymers. The composites can be fabricated into fibers, molded, or otherwise processed into useable articles. Use of this technology reduces the thermal conductivity and peak heat releases rates of the base polymer between 20%-50% while maintaining or enhancing the mechanical properties.

Executive Summary: Markets
For more thermally efficient composites exist and the sales potential of resulting consumer goods sold could be substantial. Researchers at KSC have developed a new series of polymer composite materials that can be used to expand the plastics plus additive markets. With respect to thermal conductivity and physical properties, these materials are alternatives to prior composite materials where reduction in heat transfer are needed and can be utilized in aerospace, cryogenics, automotive, military, electronics, wood plastics, food packaging, medical and textile markets. A material of this type can be made from a blend of thermoplastics, elastomers with appropriate aerogel and non-halogenated flame retardant additives, and processed on normal polymer processing equipment. These materials are useful as substitutes for metals in cryogenic and other low-temperature applications with increased ductility, important terrestrially and in space exploration.

One specific application of the polymeric composition is for use in tanks, pipes, valves, structural supports, and components for hot or cold fluid process systems where heat flow is not desired. New technology thermal barrier products for the construction industry, such as in wood plastics can also be enabled. Sports equipment and performance apparel could be developed to take advantage of the temperature stability of the new material.

Technology Development Status: Prototype

Technology Readiness Number (TRL): TRL 6

Organization Type: Academic/Gov Lab

Primary Application Area: Materials & Chemical

Specific Market Keywords: advanced materials, wood plastics, electronics

Technology Keywords: aerogel, polymer composites, flame retardant

Government Program Funding/Support to-date: - Federal (non-SBIR/STTR) Grant/Loan

License or Partner Agreements: Research licenses in aeroplastic and flame retardant technologies.

Market Size & Strategy: World engineered plastics market was forecasted to exceed 20M metric tons by 2015. The U.S. demand for plastic film is expected to grow to 15.4B in 2018, valued at $24.9B and the wood plastic composite market alone is projected to grow to ~$4.6M by 2019. Included in these demanding markets are needs for engineered composites with improved thermal efficiency for the aerospace, cryogenics, automotive, electronics, military, wood plastics, medical, food packaging and

textiles markets. A significant decrease in thermal conductivity of a storage container entails keeping food hotter or colder for a longer period of time thus energy conservation; or in garments, being more breathable, would keep the person cooler in the summer and warmer in the winter. In refrigerated transport of temperature sensitive items, these new materials can retain more uniform and stable thermal conditions with energy savings. Other applications include wood plastics where improved thermal insulation and fire resistant properties are beneficial. For the cryogenic industries, improved seals/gaskets for fluid process systems are needed and components in which thermal isolation is important, such as in engines, motors, computers, and all types of heat-generating devices/equipment. The reduced weight and life-cycle costs along with flame retardancy would be very beneficial in aerospace/aircraft applications.

Management or Innovation Team: Martha K. Williams, Ph.D., NASA, Kennedy Space Center (KSC). Current research involves the development and evaluation of specialty polymeric materials/systems for KSC/NASA's spaceport technology needs. Lead Polymer Scientist and Principal Investigator for multiple, multidisciplinary research activities. A well-published author and a diverse inventor on multiple patents/patent applications (31 to date) in flame retardant additives, aerogel composites, thermal insulation materials and thermal management systems, wiring detection and repair systems, damage detection systems, hydrogen sensing materials, microencapsulation and self-healing systems, and conductive materials/systems. Awards include the 2014 R&D100 Top Technology.

Trent M. Smith, M.S., Project Manager (Polymer Chemist), NASA, Kennedy Space Center. Mr. Smith has extensive experience in thermal insulation and foam materials, composites including nanocomposites, fire and polymers, inherently conductive polymers and electrostatic dissipative materials, radiation shielding materials, icephobic coatings and materials for low temperature or cryogenic applications. Mr. Smith has several patents, the author of journal articles and numerous NASA reports/publications/reports in studies of foam and icephobic systems. He has held many positions within NASA and currently coordinates and enables experiments on Space Station as a Project Manager for ISS flight experiments James E. Fesmire, M.S., Lead Cryogenic Engineer, NASA, and Kennedy Space Center. Founder of the world-recognized Cryogenics Test Laboratory at KSC. His work include the development and testing of energy efficient systems. His expertise in cryogenic propellant systems design and research has supported multiple NASA programs. He has been the President/active member of the Cryogenic Society of America, and active member of the International Institute of Refrigeration and multiple ASTM committees. A well-published author and an inventor on multiple patents/patent applications in cryostats instrumentation, thermal insulation materials and thermal management systems. Awards include the R&D 100 for his research work in Aerogels.

James D. Nichols Licensing Manager, NASA, Kennedy Space Center.

Other inventors: Luke B. Roberson, Ph.D. Research Investigator, NASA, Kennedy Space Center and Lanetra C. Tate, Strategic PI, NASA, HQ.

Who/What is your Competition?: composite/material with reduced heat transfer and increased ductility at low temperatures or enhanced fire resistance Competition in applications of use include polymer composites/advanced materials made of engineered thermoplastics and wood plastics. BASF, Arkema, Milliken and Clariant are examples of companies that might have some competing products

What is your value proposition?: Typically, under a license agreement, NASA seeks a royalty on net sales, annual minimum royalties and an upfront fee. Fees vary depending on the commercialization

strategy presented in a license application and whether an exclusive or non-exclusive arrangement is sought.

Are you looking for: Development / License Partners

What are your primary sources of funding?: - Other

Consider my Technology for the TechConnect Defense Innovation Summit?: Yes