Thermal Energy Conversion Branch (RPT)

Plans, conducts and directs research and technology development to advance the state-of-the art in a variety of thermal systems for aerospace, as well as non-aerospace applications. The systems-to-energy conversions of interest include thermal energy conversion for space power systems and solar thermal propulsion systems. The effort involves working at the component-level to develop the technology, the subsystem-level to verify the performance of the technology, and the system level to ensure that the appropriate system-level impact is achieved with the integrated technology. Thermal system analysis is used to identify high-impact technology areas, define the critical aspects of the technology that need to be developed and characterize the system level impact of the technology. Research involves four basic areas: space power system analysis, advanced dynamic power generation, Stirling-engine and closed Brayton cycle development, and thermal management. System analysis involves component modeling of the heat source (nuclear, chemical, solar), the power conversion unit (Brayton, Rankine, Stirling, thermionic, thermoelectric, photovoltaic, thermophotovoltaic), the energy storage, and thermal management for space power systems in the tens of watts to the megawatt range. Current power systems include the 100 W class Radioisotope

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Power Systems and 100 kW class Nuclear Electric Propulsion power systems for near term and future NASA missions. The Stirling and Brayton development program involves advanced component development in the areas of heat exchangers, oscillating flow heat transfer, high-temperature magnetics, power conditioning integration, alternator improvements, and hydrodynamic and hydrostatic gas bearings. Thermal management involves the theoretical and experimental feasibility study of advanced lightweight, survivable, deployable radiator concepts and state-of-the-art technologies to cool electronics, thus providing high-density packaging. The tasks support NASA's mission by providing dynamic power system technologies for NASA missions to the Earth, Moon, Mars, and beyond.