PHASE I PROJECT SUMMARY

Firm: Creare Incorporated
Contract #: NNX11CE57P
Project Title: Intercooled Turbo-Brayton Power Converter for Spaceflight Applications

Identification and Significance of Innovation:

Future NASA space missions require advanced systems to convert thermal energy into electric power. These systems must be reliable, efficient, and lightweight. In response, we are developing a turbo-Brayton power converter with high efficiency and specific power. The converter will use gas bearings to provide reliable, maintenance-free, long-life operation. It will also consist of discrete components that can be packaged to fit optimally with other subsystems, and its continuous gas flow can communicate directly with remote heat sources and heat rejection surfaces without ancillary heat transfer components and intermediate flow loops.

Technical Objectives and Work Plan:

We designed a turbo-Brayton power converter for future space missions by completing the following objectives:

1. We optimized our conceptual design.
2. We developed a preliminary design for the components and converter assembly.
3. We quantified thermodynamic performance.
4. We determined mass and size.
5. We demonstrated critical fabrication processes.
6. We assessed technical risks.

Technical Accomplishments:

We completed detailed analyses, trade studies, fabrication trials, and preliminary designs for the converter components and assembly.

NASA Application(s):

There are many potential NASA applications for our converter technology. The converter can be sized for coupling with radioisotope heat sources to support low-power devices such as space exploration probes and unmanned surface rovers. Our converter can also be sized for significantly greater power levels and coupled with fission reactors to support larger spacecraft as well as manned exploration of the lunar and Martian surfaces. Other applications include nuclear electric propulsion and space station power systems. Alternative heat sources include concentrated solar radiation.

Non-NASA Commercial Application(s):

Terrestrial versions of our converter can be used to produce electric power for military and civilian applications. These converters would be coupled with non-nuclear heat sources such as fossil fuel combustion, biofuel combustion, refuse burning, and concentrated solar energy. The resulting systems can be applied wherever electric generators are currently used. They will be particularly attractive for mobile applications because they have high specific power. Their hermetic, closed-loop configuration will also make them desirable in environments that have contaminants such as sand, dirt, and dust, and in environments that are exposed to corrosive substances such as sea water.

Name and Address of Principal Investigator:

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