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| **Fiscal Year:** | FY 2012 | **Task Last Updated:** | FY 02/27/2012 |
| **PI Name:** | Snook, Kevin Ph.D. | | |
| **Project Title:** | Wideband Single Crystal Transducer for Bone Characterization | | |
| **Division Name:** | Human Research | | |
| **Program/Discipline:** | HUMAN RESEARCH | | |
| **Program/Discipline--Element/Subdiscipline:** | HUMAN RESEARCH--Operational and clinical research | | |
| **Joint Agency Name:** | | **TechPort:** | No |
| **Human Research Program Elements:** | (1) **ExMC**:Exploration Medical Capabilities | | |
| **Human Research Program Risks:** | (1) **Medical Conditions**:Risk of Adverse Health Outcomes and Decrements in Performance Due to Medical Conditions that occur in Mission, as well as Long Term Health Outcomes Due to Mission Exposures | | |
| **Space Biology Element:** | None | | |
| **Space Biology Cross-Element Discipline:** | None | | |
| **Space Biology Special Category:** | None | | |
| **PI Email:** | kevin@trstechnologies.com | **Fax:** | FY |
| **PI Organization Type:** | INDUSTRY | **Phone:** | (814) 238-7485 |
| **Organization Name:** | TRS Ceramics, Inc. | | |
| **PI Address 1:** | 2820 East College Avenue | | |
| **PI Address 2:** | | | |
| **PI Web Page:** | | | |
| **City:** | State College | **State:** | PA |
| **Zip Code:** | 16801-7548 | **Congressional District:** | 5 |
| **Comments:** | | | |
| **Project Type:** | GROUND | **Solicitation / Funding Source:** | SBIR Phase II |
| **Start Date:** | 01/31/2012 | **End Date:** | 05/31/2016 |
| **No. of Post Docs:** | | **No. of PhD Degrees:** | |
| **No. of PhD Candidates:** | | **No. of Master' Degrees:** | |
| **No. of Master's Candidates:** | | **No. of Bachelor's Degrees:** | |
| **No. of Bachelor's Candidates:** | | **Monitoring Center:** | NASA JSC |
| **Contact Monitor:** | Watkins, Sharmi1a | **Contact Phone:** | 281.483.0395 |
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| **Flight Program:** | | | |
| **Flight Assignment:** | NOTE: End date changed to 5/31/2016 (originally 1/31/2014) per HRP Technology Pipleline spreadsheet from B. Corbin (Ed., 9/9/14) | | |
| **Key Personnel Changes/Previous PI:** | | | |
| **COI Name (Institution):** | | | |
| **Grant/Contract No.:** | NNX12CA28C | | |
| **Performance Goal No.:** | | | |
| **Performance Goal Text:** | | | |

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| **Task Description:** | TRS proposes to develop a simple-to-use, launch capable, ultrasound transducer that is capable of producing the necessary bandwidth to accurately determine in vivo bone characteristics that correlate to loss of strength in astronauts in long-duration space flights (microgravity). The transducer will be capable of measuring backscatter, attenuation, reflectivity and other ultrasound parameters of bone in the spine or hip that have been correlated with physiological bone density, structure and porosity through systems that provide high fidelity but are not space-capable. The Phase I program showed that a compact ultrasound transducer with more than 4 octave bandwidth could be produced using the special properties of single crystal piezoelectrics and special processing techniques, a bandwidth 175% larger than that of conventional transducers. The Phase II program will extend the capabilities of the Phase I transducer by providing more sensitivity, and optimizing the frequency content relative to the acoustic field. Additionally, TRS will team with Stony Brook University to further analyze the relationship between the bone structure and ultrasound parameters towards eventual use in space. TRS will deliver a robust, wideband transducer that can be integrated with NASA components at the end of the program.<br>POTENTIAL NASA COMMERCIAL APPLICATIONS: With the potential as a low-cost system, the ultrasound method could be implemented as a series of units for astronauts both in space and before or after returning. The applications of the material and methods can also be integrated into other areas, such as evaluation of materials (non-destructive evaluation) while on the job. The cryogenic performance advantages of single crystal have been shown in adaptive optics applications, showing that this could be a very adaptable technology. |
| **Rationale for HRP Directed Research:** | |
| **Research Impact/Earth Benefits:** | There is potential for the ultrasound system to be used as a low-cost diagnostic tool in the medical setting, particularly in areas where the larger, more costly imaging tools such as CT and MRI are not available. The additional information from this method could also surpass these modalities. This includes other pathologies such as skin cancer. The concept of the transducer could be expanded to other frequency ranges, and could be used in industrial or defense applications. Acoustic spectroscopy is used to evaluate fatigue as structure crack over time and acoustic signatures across the structure change. A wider frequency range could provide more fatigue data. |
| **Task Progress:** | New project for FY2012. Reporting not required for this SBIR Phase 2 project. |
| **Bibliography Type:** | Description: (Last Updated: ) |