

**SBIR Topic Number:**  
AF081-094

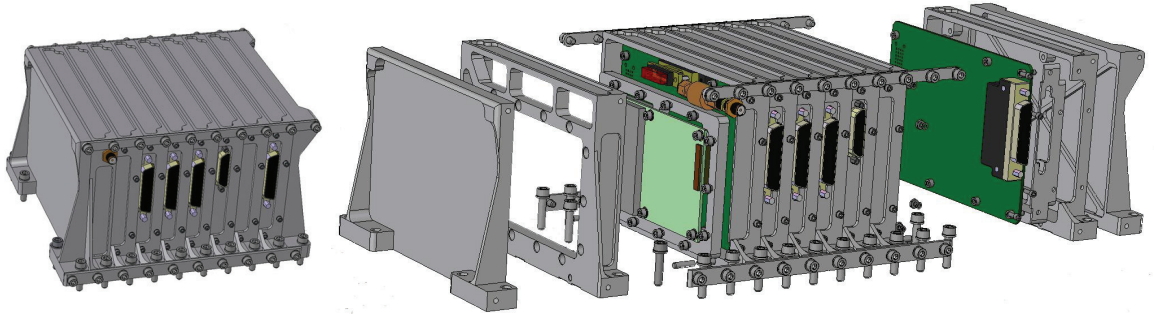
**SBIR Title:**  
Novel Mitigation  
Techniques for  
Reconfigurable  
Computers  
for Space Based  
Applications

**Contract Number:**  
FA9453-09-C-0027

**SBIR Company Name:**  
Space Micro Inc.,  
San Diego, CA

**Technical Project Office:**  
AFRL Space Vehicles  
Directorate, Kirtland  
AFB, NM

This Air Force SBIR/STTR Innovation Story is an example of Air Force supported SBIR/STTR technology that met topic requirements and has outstanding potential for Air Force and DoD.



Left: 8-Slice P200k CP&DH. Right: Exploded view of the P200k CP&DH chassis with 8 slices.

## Space Qualified, Radiation Hardened Command, Power and Data Handling System

- Future military satellites will require a modular command, power, and data handling avionics system that can be quickly and cost-effectively modified to meet mission needs
- The primary purpose of Space Micro's P200k CP&DH avionics suite is to support a flight mission incorporating a target simulation payload that will transmit data where errors are unacceptable
- Space Micro developed the Proton200k™ Command, Power, and Data Handling (P200k CP&DH) system, which is a highly modular, radiation hardened avionics suite that can provide central power distribution and payload management functions
- Due to its modularity, small size, low power consumption, and radiation hardness, it is ideal for the growing number of nano, micro, and small satellite systems that have very specific mission needs

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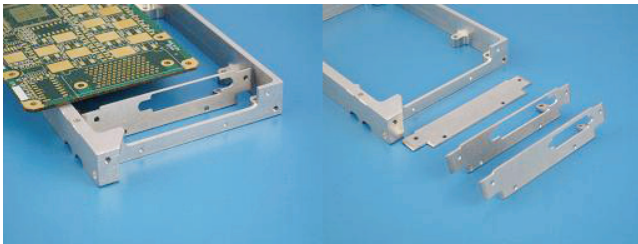
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## Air Force Requirement

Demand for high performance on-board processing for space-based applications is being driven by new and challenging Department of Defense, commercial, and civil applications. Reconfigurable systems can be used to support a varying array of processing applications, but current radiation hardened systems are too large, consume too much power, and do not provide a high level of computing performance that is required for many future military satellites. These satellites will require a modular command, power, and data handling avionics system that can be quickly and cost-effectively modified to meet mission needs.

## SBIR Technology

Under this Phase II SBIR project, Space Micro developed the Proton200k™ Command, Power, and Data Handling (P200k CP&DH) system, which is a highly modular, radiation hardened avionics suite that can provide central power distribution and payload management functions for a wide variety of mission needs. The P200k CP&DH system uses a series of innovative radiation hardening techniques on carefully selected commercial components in order to provide high performance and high reliability.



**Mechanical slice showing how various board-edge connectors are accommodated**

The system was architecturally designed into a format that provides for electrical and mechanical modularity, while simultaneously resulting in a very small size. The modular approach to the electrical, mechanical, and software designs proved invaluable in allowing the designs to be completed with a degree of maturity that would have otherwise been extremely difficult.

## Potential Air Force Application

The original primary purpose of Space Micro's P200k CP&DH avionics suite is to support a flight mission incorporating

a target simulation payload that will transmit data where errors are unacceptable. Beyond this very specific application, this avionics suite can be used for a wide range of satellite missions.

Although each satellite will have different system requirements, the P200k CP&DH can address them through its ease of reconfiguration, extensive use of commonality, and modularity. Slices can easily be added, removed, or swapped out in order to customize the suite to match specific mission needs. Additionally, due to its small size, low power consumption, and radiation hardness, it is ideal for the growing number of nano, micro, and small satellite systems that have very specific mission needs.

## Company Impact

This SBIR project has allowed Space Micro to advance in several technical areas and to further expand its expertise in radiation hardened space equipment. The P200k CP&DH can be easily reconfigured to meet a huge range of mission needs, and therefore has the potential to transition into a very large number of future defense and commercial satellite systems.

The system modularity that Space Micro developed for this project allows a single system to be expanded or reconfigured quickly, easily, and cost effectively. This places Space Micro in an advantageous position to support future satellite missions because it will be able to reconfigure existing, proven technology to meet specific mission needs, therefore reducing cost and making the process faster and more efficient. This will also help Space Micro's technologies gain flight heritage.

The system modularity also proved valuable to Space Micro because it allowed for a rapid completion of the project, including testing. This approach will play a role in future research and development, therefore increasing the success rate and mitigating the risk of working on advanced satellite systems.

Space Micro is a high technology firm with a special focus on space and military applications. Founded in 2002, Space Micro is a privately held, employee-owned company, with headquarters in San Diego, California. It is a pioneer in providing radiation hardened by design solutions for advanced electronic systems and microelectronics.



# SBIR/STTR

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