

**SBIR Topic Number:**  
AF06-273

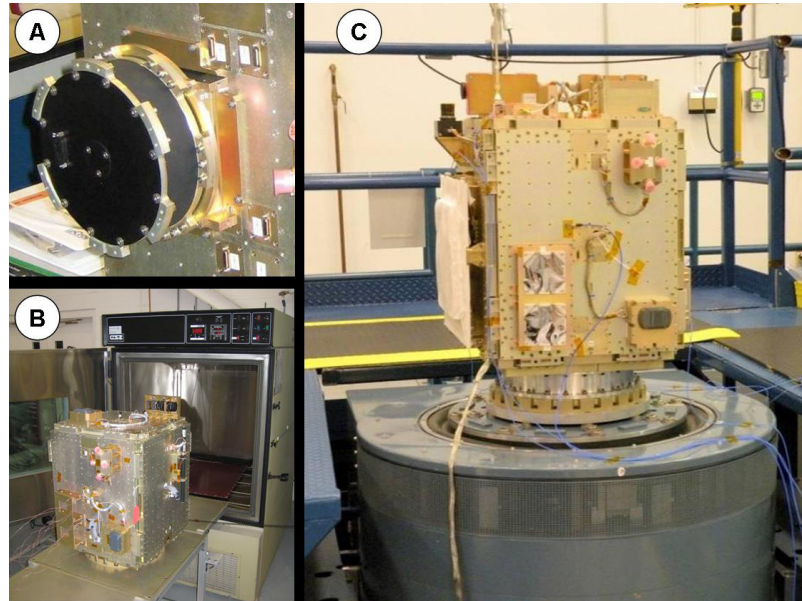
**SBIR Title:**  
Plug-and-Play (PnP)  
Structures for Satellite  
Applications

**Contract Number:**  
A9453-07-C-0053

**SBIR Company Name:**  
SpaceWorks, Inc.  
Scottsdale, AZ

**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.



**Image A – One of the components designed for PnP compatibility. Image B – Partially integrated PnP satellite during thermal cycle testing. Image C – Fully integrated PnP satellite during vibration testing.**

## Reconfigurable Plug-and-Play Spacecraft Structure

- Technological advancements in responsive spacecraft structures, plug-and-play (PnP) compatible space electronics packaging, and new approaches for rapid assembly, integration, and test are needed
- SpaceWorks developed and demonstrated an approach for recessing the PnP electronics and harnessing within the structural panels to increase the footprint and volume for spacecraft components and payloads
- The spacecraft panels incorporated hinged joints to enable easy access to interior and exterior components
- Responsive space structures, modular PnP-compatible space electronics packaging, and new approaches for rapid assembly, integration, and test should enable the Air Force to produce new space systems in days and at significantly reduced costs when compared to traditional systems

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## Air Force Requirement

The Air Force is working to develop responsive space systems designed to meet the requirements of the tactical user, assembled, integrated, tested, and launched all within days of the need.

The Air Force Research Laboratory has demonstrated that Space Plug-and-Play Avionics (SPA) has the potential to be an enabling technology for these missions. Similar technological advancements are also needed in responsive spacecraft structures, flexible thermal management systems, plug-and-play (PnP) compatible space electronics packaging, and new approaches for rapid assembly, integration, and test.

## SBIR Technology

SpaceWorks developed and demonstrated an approach for recessing the PnP electronics and harnessing within the structural panels to increase the footprint and volume for spacecraft components and payloads. The spacecraft panels incorporated hinged joints to enable easy access to interior and exterior components during assembly, integration, and test and then locked in place for launch.

Modular PnP-compatible components were developed that were able to be electrically and mechanically integrated with the spacecraft within minutes. Rapid assembly, integration, and test approaches were developed that will help reduce the time needed from months to less than seven days.

## Potential Air Force Application

Responsive space structures, modular PnP-compatible space electronics packaging, and new approaches for rapid assembly, integration, and test will help the Air Force and other U.S. Government organizations produce space systems which meet responsive space goals.

These new missions will be launched quickly and will provide data to users almost immediately. Ultimately, the cost for these systems could be a small fraction (possibly as low as 10%) of the cost of traditional systems.

## Company Impact

"Our collaboration with AFRL through the SBIR/STTR Program has enabled SpaceWorks to develop new approaches for spacecraft that we have been imagining for a few years," said Jeff Preble, President of SpaceWorks. "Now, AFRL and SpaceWorks have designed, built, and tested space flight hardware that can be custom-configured, assembled, tested, and readied for launch in days."

SpaceWorks provides products and engineering services to the aerospace community, specifically in the areas of small spacecraft, spacecraft constellations and instrument development. This includes mission and systems engineering, structures and mechanism design, analysis and fabrication, composite multifunctional structures, and inter-spacecraft communications and ranging solutions.

Jeff Preble  
President  
SpaceWorks, Inc.



# SBIR/STTR

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