

30% Efficient Multi-Junction Space Solar Cells

PROBLEM/OBJECTIVE

The Department of Defense (DoD) needs high power, cost-effective space power generation. US multi-junction solar cell manufacturers are facing international competition, along with growing power, mass, and volume requirements for warfighter-specific payloads.

The objective of this program is to collaborate with solar cell manufacturers to mature manufacturing processes and accelerate insertion of space-qualified, high efficiency, multi-junction solar cells.

ACCOMPLISHMENTS/PAYOFF

Process Improvement: Air Force ManTech and the Space and Missile Center (SMC) collaborated with solar cell manufacturers to enable key improvements in the critical performance, mass, and volume of warfighter-specific satellite payloads.

The primary tasks involved the fabrication of larger quantities of large area cells, improving the uniformity of cells grown across the wafer, improving the yield, and optimizing the manufacturing process. A secondary task of this program was to space-qualify the cells to the AIAA standard.

Implementation and Technology Transfer:

To transition the development of 30% high-efficiency solar cells, ManTech focused on manufacturing process improvement areas that would have high payoff for the Air Force (AF) by ensuring the strict manufacturing requirements needed for successful operation in a space environment. SMC funds were used to perform the qualification tests needed to ensure the durability and performance of the cells. ManTech expects that advances in this high-risk technology area will offer major rewards for the AF and DoD by delivering next-generation power capability and will bolster the US industrial base for space technology.

Numerous satellites will benefit from higher efficiency solar cells, including Advanced Extremely High Frequency Satellites, Wideband Global SATCOM, Space Based Infrared Systems, Space Tracking and Surveillance Systems, and the Next Generation Global Positioning System.

Expected Benefits and Warfighter Impact:

The availability of increased-efficiency solar cells means that satellite manufacturers can shrink the size and mass of solar arrays, reducing total system mass, volume, and cost. This will significantly reduce solar array cost per watt, as well as reduce array mass by 15%-17% based on efficiency increases alone.



TIMELINE/MILESTONE

Start Date	August 2007
End Date	December 2010

FUNDING

Air Force ManTech	\$2,420K
Air Force Space & Missile Command	\$1,688K

PARTICIPANTS

AFRL ManTech, WPAFB OH
Space and Missile Center CA
AFRL Space Vehicles Directorate, Kirtland AFB NM
Spectrolab CA
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