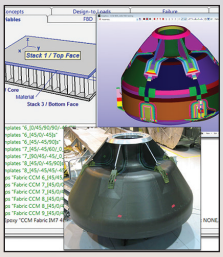
National Aeronautics and Space Administration

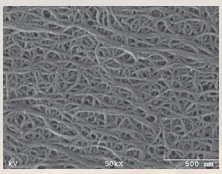
Orion and Space Launch System Spinoffs

NASA's Orion spacecraft is designed to take astronauts farther than anyone has ever gone before: to the moon, an asteroid, and even Mars. To propel Orion into space, NASA is also developing what will be the most powerful rocket ever built, the Space Launch System (SLS). SLS and Orion will provide entirely new capabilities and will initiate the next chapter of our nation's exploration of the solar system. All of this will be powered by cutting-edge technology that has applications not only in space but on Earth as well: advanced materials, manufacturing techniques, design software, and life support equipment are just a few of the many spinoffs that have already come from Orion and SLS—with many more sure to come.



Design Software Lightens Aircraft Structures

Collier Research Corporation, of Hampton, Virginia, licensed NASA software to design strong structures while using as little weight as possible. The first ever license of NASA-developed software, HyperSizer has now been used to design commercial space transport vehicles as well as commercial aircraft and wind turbines. The company has sales of $4 million a year and has received several Small Business Innovation Research (SBIR) contracts to apply its software to nearly all aspects of the new Orion crew capsule design.

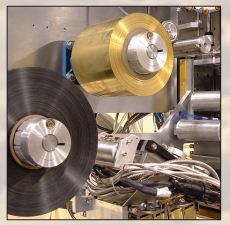


Advanced Manufacturing Techniques Create Better Nanotubes

To reduce Orion's weight as much as possible, NASA explored the use of cutting-edge materials such as single-walled carbon nanotubes. SBIR contracts supported the development and demonstration of a nanotube production method pioneered by SouthWest NanoTechnologies Inc. (SWeNT), of Norman, Oklahoma. SWeNT's scalable, efficient process results in mass-produced nanotubes that are customizable to client needs, purer than those created by other methods, and applicable in everything from advanced body armor to energy-efficient lighting.

Procedure-Authoring Tool Improves Safety on Oil Rigs

Dark, cold, and dangerous environments are plentiful in space and on Earth. To ensure safe operations in difficult surroundings, NASA relies heavily on procedures written well ahead of time. Houston-based TRACLabs Inc. worked with Ames Research Center through the SBIR program to create an electronic procedure-authoring tool, now used by NASA for Orion and also by companies in the oil and gas industry.



Custom Machines Advance Composite Manufacturing

NASA has explored the possibility of using composite materials in future spacecraft, and the agency created an Orion prototype called the Composite Crew Module to test such technologies. Working under a NASA contract, Accudyne Systems Inc. of Newark, Delaware, developed a device for creating thermoplastic composite structures without the use of an expensive autoclave. The partnership yielded technology for the company's commercial, custom-built composite manufacturing machines, helping advance composite part fabrication.

Control Algorithms Charge Batteries Faster

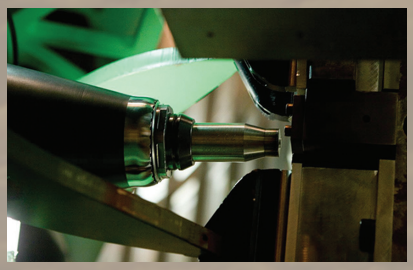
Advanced Power Electronics Corporation of Orlando partnered with Glenn Research Center through the SBIR program to develop an advanced power converter for space systems. The company incorporated control algorithms created through the partnership into a solar charger that charges batteries 30 percent faster than comparable devices.

Smart Sensors Assess Structural Health

NASA frequently inspects launch vehicles, fuel tanks, and other components for structural damage. In 2001, Acellent Technologies Inc., of Sunnyvale, California, received SBIR funding to develop a smart sensor for aerospace vehicles and structures such as the Composite Crew Module. As a result, Acellent expanded the technology's capability and now sells it to aerospace, defense, automotive, construction, energy, utility, and transportation companies for structural condition monitoring, damage detection, crack growth monitoring, and other applications.

Life Support Systems Protect Deep-Sea Divers

Paragon Space Development Corporation, based in Tucson, Arizona, worked with NASA on life support systems for next-generation spacecraft such as Orion. The company has used the same technology for advanced suits that protect specialist divers working in extreme and dangerous conditions, such as high pressure, toxic chemical spills, the hot waters of the Persian Gulf, and chemical warfare agents.



Innovative Tools Advance Revolutionary Weld Technique

NASA's SLS tanks are being constructed using friction stir welding (FSW), a solid-state welding process that results in stronger, nearly defect-free joints. Nova-Tech Engineering LLC, of Lynnwood, Washington, licensed NASA technology that significantly improves FSW in multiple respects by using an auto-retractable pin tool. The innovation now allows Nova-Tech's FSW machines to perform effective welds for offshore drilling rig piping, armor plating, and rocket manufacturing.

For more information about these and other NASA spinoffs, please visit **http://spinoff.nasa.gov**.

NP-2014-11-1288-HQ