



Marshall Space Flight Center  
Technology Transfer  
Huntsville, Alabama



# NASA Technology Changing the World Every Day...

*Tax dollars spent in space have resulted in Earth-bound technology used to improve everyday life in homes and communities. Those NASA-related technologies include long distance telephone networks, powerful computers, laser surgery, ultrasound scanners, satellite navigation and communications, advanced materials for airplanes, shock-absorbing athletic shoes, radiation-blocking sunglasses and numerous fire and safety innovations. The following items are derived from technology developed at NASA's Marshall Space Flight Center in Huntsville, Ala.*

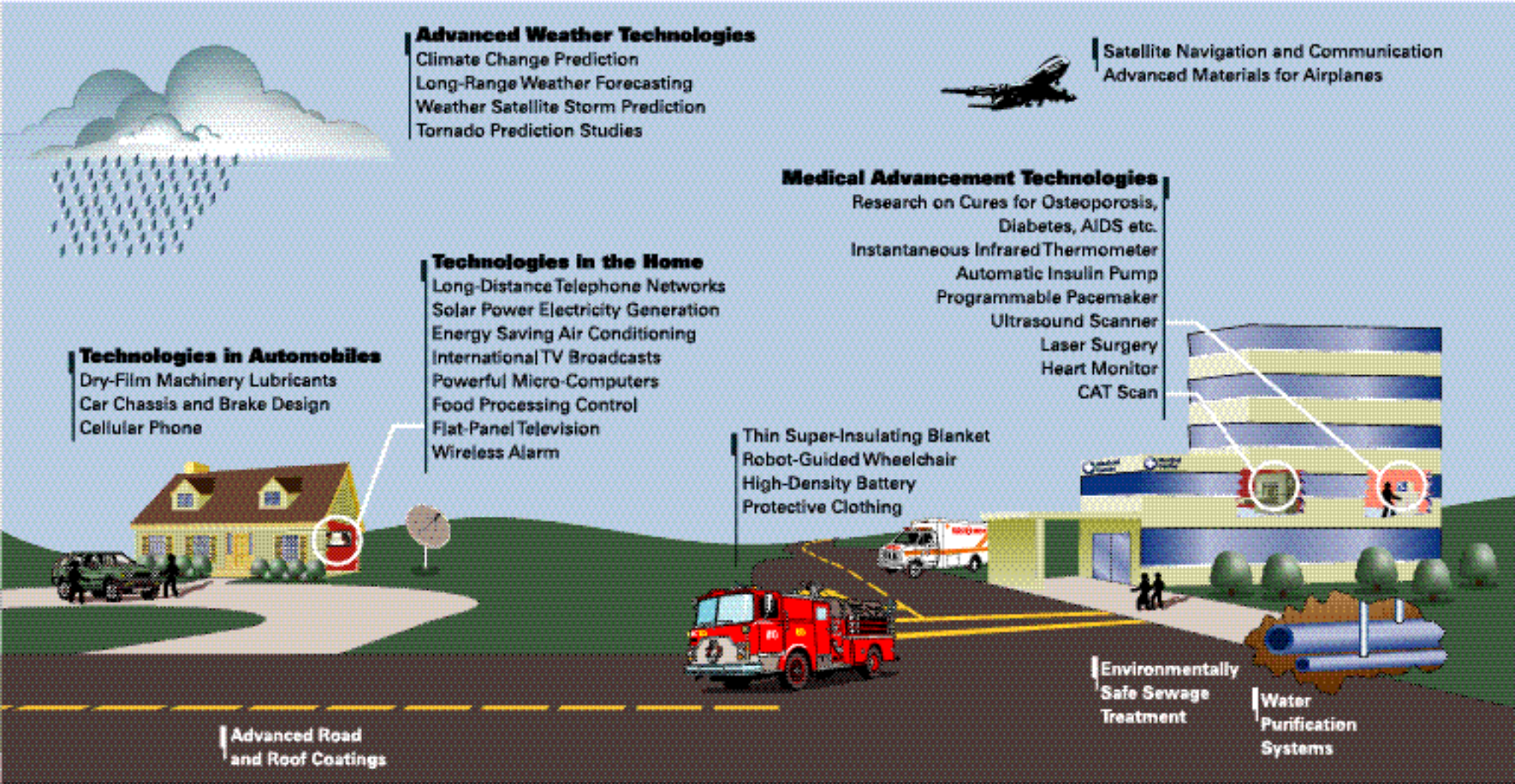


Climate/Tornado Prediction  
NASA technology developed for use in the cold reaches of space is helping researchers fight back against sweltering urban heat here on Earth. Scientists for Marshall Center's Global Hydrology and Climate Center are working to make cities more habitable by studying and documenting patterns of heat formation. This information helps determine strategies to reduce "heat islands," such as the installation of reflective roofing and paving materials to bounce thermal energy back into the atmosphere. In a new project, Marshall Center scientists have begun studying lightning strikes and hope some day to be able to predict tornadoes by studying those lightning patterns.

Road and Roof Coatings  
A process developed for applying heat-resistant coatings to the Space Shuttle's Solid Rocket Boosters has been used to coat rooftops and roadways. The Convergent Spray Technologies (CST) spray process was used to apply a NASA-developed roof coating that is environmentally friendly, stronger and more weather-resistant than conventional coatings. Roadways are being made more skid-resistant through the use of CST spray process. Those road coatings are applied in a fraction of the time of conventional road resurfacing and the cost is significantly less than with traditional methods.

Firemen Working Safer  
Products developed through the Marshall Center are making lives safer and jobs easier for firemen. Aluminized polymer film material used in creating radiation barriers for the Apollo and other spacecraft is being used to insulate fire suits. The material is capable of reflecting as much as 97 percent of radiant heat, protecting firemen from the heat while they do their jobs. Cutting technology developed at NASA is reducing the potential for low-back injury to fire-fighters. The Lifeshear Cutter was developed from NASA pyrotechnic separation technology that is used in explosive bolts that hold Solid Rocket Boosters in place prior to ignition.

**NASA investments in space have yielded more than 1,200 spinoffs used to enrich lives on Earth every day.**



Crime Caught on Tape  
NASA technology is giving law enforcement a clearer picture of crimes caught on tape. Video Image Stabilization Technology (VISAR) uses technology developed for enhancing images of the Sun to analyze video or film frames pixel by pixel to create a sharper image. The program stabilizes camera rotation and zoom effects, reduces video noise or "snow," and de-blurs images. VISAR was first used by law enforcement when the FBI's Southeast Bomb Task Force needed to clarify home video of the bombing at the 1996 Olympic Games in Atlanta, Ga.

Compressed Symbology  
Product identification technology pioneered at NASA's Marshall Space Flight Center for tracking Space Shuttle parts is being used to mark everything from groceries to automobile parts. The two-dimensional matrix symbol is a small, square-shaped mark resembling a checkerboard but is capable of storing as much as 100 times as much information as a one-dimensional, linear barcode in the same amount of space. The mark can be applied to almost any surface using a number of methods including laser, dot peen, micro-sandblast, machine engraving, permanent inks and embroidery.

Memory Metal Alloys  
Home and industrial safety products are being produced using memory metal alloys created at the Marshall Center for the *International Space Station*. These metal alloys can change from shape to shape depending on temperature fluctuations, then the alloys return to their original shape. A valve made of the memory metal is making bathing safer. The valve reacts to water temperature, and restricts flow to a trickle if a scald hazard occurs. When the water temperature returns to a safe level, the unit permits a return to normal flow.

LEDs Used to Save Lives  
Technology developed for growing plants in space is giving cancer patients a new lease on life. The technology has been used successfully to treat cancer patients who have exhausted traditional therapies, and shows promise in wound-healing applications. The cancer treatment, called photodynamic therapy, uses tiny pinhead-sized, light-emitting diodes (LEDs) to illuminate or activate light-sensitive, tumor-treating drugs called photosensitizers. The light activation allows the drugs to find and destroy cancerous cells, leaving surrounding tissue undamaged.

Frozen Foods Made Safer  
Frozen food may become environmentally friendly thanks to a new, environmentally friendly refrigeration system, developed for NASA to use aboard its Space Shuttle and *International Space Station*. The pulse-tube refrigeration unit offers a viable alternative to units that use ozone-destroying chloro-fluorocarbon and hydrochlorofluorocarbon refrigerant fluids by using helium, which is non-toxic to humans and harmless to the environment, as the working fluid.

Airport Safety Aid  
Air turbulence at busy airports is being studied using a wind-sensing device developed with NASA technology. The Laser Doppler Velocimeter (LDV) takes advantage of aerosols normally present in the atmosphere such as dust particles to reflect infrared light beamed out by a laser. The reflected radiation is picked up by the LDV, and since the aerosols move with the wind, it is possible to measure wind velocities, including aircraft wake winds and turbulence

Landmine Removal  
Land mines are being detonated and eliminated using scrap propellant developed for NASA Solid Rocket Motors. The propellant is packed inside a temperature flare to incinerate and/or detonate the mines. Anti-personnel mines are priced from \$3 to \$30 each, but the cost to the international community of neutralizing them ranges from \$300 to \$1,000. Because the use of scrap propellant is free, the projected cost for demining using the flare is between \$6 and \$15.

Safer Deliveries for Babies  
Babies may soon have a safer entry into the world thanks to fiber-optic materials developed for hydrogen and oxygen tanks utilized by NASA. The technology will be implanted inside the handles of obstetrical forceps to sense deflation and pulling force. The monitor provides the physician with pressure readings immediately that can be adjusted for the welfare of the infant and mother.

## Waste Remediation System

Cleaner water on Earth is the result of technology developed by NASA's Marshall Space Flight Center. The new wastewater treatment system is based upon the metabolic activity of phototrophic bacteria. This system requires no air flow, uses sunlight as an energy source, and does not generate carbon monoxide. It offers significant advantages over conventional waste-treatment systems in terms of flexibility, safety and performance.

## Moveable Knee Brace

A knee brace developed using NASA technology will offer freedom of movement to patients suffering from a wide variety of lower extremity weaknesses. The device, called the Selectively Lockable Knee Brace, will facilitate faster, less painful rehabilitation by allowing movement of the knee. Knee braces currently on the market lock the knee in a rigid, straight-leg position, or at a pre-set position of flexion or extension.

## Portable Seat Lift

Persons who cannot sit down or stand up easily may get a boost—literally—from a portable lifting seat developed and patented by scientists by NASA. The light-weight, battery-powered lifting device is capable of assisting individuals who weigh up to 300 pounds and have severe degenerative conditions in their knees, hips and/or backs. Those individuals would normally use mechanical chairs at home and would require assistance outside the home, but the device's portability will offer a new degree of freedom.

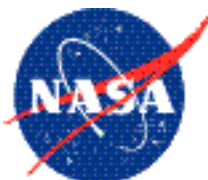
## Quick-Connect Fastener

Quick-construction techniques developed by NASA for use space have Earth-bound applications in fire fighting equipment, high-compression gas bottles, under water salvage equipment and in industrial applications such as assembly line machinery and industrial cranes. The Quick-Connect Fastener evolved from technology used in NASA's Pathfinder Program and was designed for easy assembly in weightless aerospace environments.

## Contact Information

Marshall Space Flight Center's Technology Transfer Department,  
visit <http://www.nasasolutions.com/>

Spinoff Magazine on the web at <http://www.sti.nasa.gov/tto/>



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