

NASA Explores. Humanity Benefits.

Life-Saving Medical and Health Care Benefits

- **Cancer Detection and Treatment**

LED (Light-Emitting Diode)—LED is special lighting technology that was originally used for plant growth experiments aboard the Space Shuttle. This technology is now being used in a form of chemotherapy to treat brain tumors in children and many other forms of cancer. The device helps ease the pain and discomfort associated with cancer treatment.

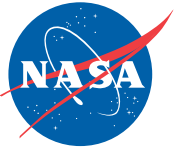
- **Cardiovascular Treatments**

Pacemaker Implant—Pacemakers used to treat cardiac patients, as well as the remote monitoring devices for intensive care patients, were derived from the telemetry systems that first monitored astronauts and spacecraft. Communication technology that first monitored the gap between Earth situations and orbiting satellites also enables doctors to directly communicate with pacemakers implanted in the human body.

Artificial Heart Implant—The technology used in the Space Shuttle fuel pumps led to the development of a miniaturized ventricular-assist pump. The tiny pump is 2 inches long and 1 inch in diameter and weighs less than 4 ounces.

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Medical and Health Care Benefits For Women

- **Detection of Breast Cancer**

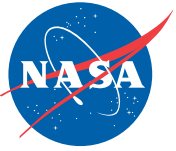
Breast Biopsy System—Silicon chips in the Hubble Space Telescope that convert a distant star's light directly into digital images have been adopted so that doctors can easily detect tiny spots in breast tissue. Locating the exact spot allows doctors to analyze the tissue using a needle. This non-surgical procedure is less traumatic and reduces the pain, scarring, radiation exposure, time, and money associated with surgical biopsies.

Faster, Safer, and Easier Mammograms—Space-based instruments used to study the atmosphere may soon have a place in the medical examination room, since atmospheric studies and mammography both require compact, reliable, low-power sensors and digital computers. The computer scans each part of the mammogram image and reports any suspicious areas. This technology—which will be faster, safer, and easier to use—will save countless lives.

New, Non-Intrusive Ultrasounds—Technology developed to improve the quality of pictures from Mars Pathfinder is being modified to make 3-dimensional models of breast tissue. This will allow physicians to differentiate between cancerous and healthy tissue without painful invasive procedures.

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Medical and Health Care Benefits For Children

- **Treatment of Attention Deficit Disorder (ADD)**

Video Game Treatment for ADD—In America, an increasing number of children are being treated for ADD. NASA research on brain waves has a practical application in this area. The technique uses computer games and biofeedback to treat this disorder. The treatment involves monitoring brainwaves of children and trying to get them to modify brain activity that helps them concentrate. Because children are happy to play video games, the treatment is proving popular and effective.

- **Enriched Baby Food**

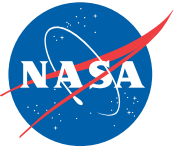
Formulaid—NASA-sponsored research exploring the potential use of algae as a recycling agent for long-duration space travel has led to the development of enriched baby food. The formula being fed to an infant contains an algae-based additive highly enriched in nutrients that are believed to be beneficial for infants' mental and visual development.

- **Rapid, Easy Temperature Readings**

Infrared Thermometer—Each year in the United States, 2 billion temperature readings are taken. Infrared sensors originally developed to remotely measure the temperature of distant stars and planets led to the development of the handheld optical sensor thermometer. Placed inside the ear canal, the thermometer provides an accurate reading in 2 seconds or less. This device can even be used when a child is not awake.

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Firefighter Safety Benefits

- **Firefighter Air Breathing System**

The conventional firefighter air breathing system was heavy, cumbersome and so physically taxing that it induced extreme fatigue. Many firefighters opted not to use the equipment and smoke inhalation injuries increased dramatically. Today's air breathing system incorporates materials and technology from NASA into a lighter, less bulky breathing apparatus. The air tank weighs one-third less than traditional gear and is pressurized at twice the level.

- **Infrared Camera**

Infrared technology was used on the Apollo program to simulate sunlight and a sensitive infrared hand-held camera is used to observe the plumes from the Space Shuttle. This NASA technology is currently used to scan for fires. The camera was used to point out hot spots during the brush fires that ravaged Malibu, California in 1996, thereby increasing the level of safety for firefighters.

- **Satellite Tracking of Fires**

NASA's Earth Observing System consists of satellites capable of relaying near-real-time information. These satellites can transmit the location, area, and extent of a fire. They can also track the direction of fires, the size of smoke plumes, and projected pollution effects. This assists U.S. Forest Service fire managers in evaluating the level of danger for firefighters and determining where to deploy resources.

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Household, Consumer and Recreation Benefits

- **Household Efficiency, Safety, and Comfort**

Cordless Power Tools and Appliances—On the Moon, astronauts used specifically developed portable tools that were the direct predecessor of today's cordless screwdrivers, drills and other rechargeable power tools. Cordless power tools and appliances are one of the most successful commercial spin-offs of space-based technology.

Household Smoke Detectors—A technology originally developed for NASA's Skylab spacecraft, smoke detectors are now required by law to be placed in all homes and are universally credited for saving countless lives.

Mattresses/Pillows—NASA originally developed a foam technology to relieve the enormous force of gravity at liftoff. This technology is now used in mattresses and pillows to evenly distribute weight and body pressure points.

- **Cutting-Edge Sports Equipment**

Golf Balls and Golf Clubs—A recently designed golf ball employs NASA aerodynamics technology to create a more symmetrical ball surface, sustaining initial velocity longer and producing more stable ball flight for better accuracy and distance. Composite golf clubs are also a result of NASA technology.

Athletic Shoes—Originally developed for lunar boots, a unique NASA material for cushioning and ventilation has been modified and incorporated in the midsole of athletic shoes to improve shock absorption and provide superior stability and motion control.

Insulation for NASCAR—Materials from the Space Shuttle thermal protection system are used on NASCAR racing cars to protect drivers from the extreme heat generated by the engines.

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Transportation Benefits

- **Cleaner, Quieter, and Economical Commercial Aircraft**

Turbofan—Multiple NASA developed technological advancements resulted in a cleaner, quieter, more economical commercial aircraft engine. The turbofan features a 10 percent reduction in fuel consumption, lower noise levels, and emission reductions.

- **Development of Natural Gas-Powered Car**

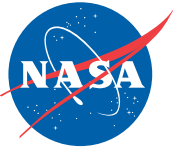
Gas-Leak Detection System—A gas-leak detection system, originally developed to monitor the Space Shuttle's hydrogen propulsion system, is currently being used by the automobile industry in the development and production of a natural gas-powered car.

- **Improved Radial Tires**

Increased Tread Life—Viking Lander parachute shroud material was adapted and used to manufacture radial tires. Increasing the tire material's chain-like molecular structure to five times the strength, this technology can increase tread life by 10,000 miles.

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Environmental Benefits

- **Clean, Safe Water**

Water-Purification System—Water-purification technology used on the Apollo spacecraft is now employed in several applications to kill bacteria, viruses, and algae in community water-supply systems and cooling towers. Among the applications is a line of home and portable water filters. Filters mounted on faucets can reduce lead in water supplies.

- **Clean, Safe Air**

Air Purification—Indoor air pollution is a realistic threat to human health. NASA research demonstrated that the use of household plants can help remove harmful pollutants from the air we breathe. The results showed that 15 to 20 houseplants can effectively purify the interior of a typical 1,800-square-foot house.

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