More Spin-offs

Lesson 2 of 2

Grade Level: 5-8
Subjects: Science, Technology
Prep Time: < 10 minutes
Activity Duration: 10-30 minutes
Materials Category: None

National Education Standards				
Science	Mathematics	Technology		Geography
		ISTE	ITEA	
6			1,3,4,6	

Objective: To expose students to spin-offs from NASA technology through a word search.

Materials:

- None

Related Links:

Related NASA Site
Spin-off Online
http://www.sti.nasa.gov/tto/spinoff.html

More Spin-offs

Teacher Sheets

Guidelines

1. Read the 5-8 NASAexplores article, "What Can I Wear Today?"
2. Pass out the Student Sheets.
3. Below are the spin-offs found in the word search, along with a brief description.

- Artificial Heart - The technology used in Space Shuttle fuel pumps led to the development of a miniaturized ventricular assist pump by NASA and renowned heart surgeon Dr. Michael DeBakey. The tiny pump — 2-inches long, 1-inch in diameter and weighing less than four ounces — is currently undergoing European clinical trials where it has been successfully implanted into more than 20 people.

- Automotive Insulation - 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.

- Balance Evaluation Systems - Devices built to measure the equilibrium of Space Shuttle astronauts when they return from space are widely used by major medical centers to diagnose and treat patients suffering head injury, stroke, chronic dizziness, and central nervous system disorders.

- Bioreactor - Developed for Space Shuttle medical research, this rotating cell culture apparatus simulates some aspects of the space environment, or microgravity, on the ground. Tissue samples grown in the bioreactor are being used to design therapeutic drugs and antibodies. Some scientists believe the bioreactor will routinely produce human tissue for research and transplantation.

- CAT Scanners and MRI technology - Computer-Aided Tomography and Magnetic Resonance Imaging used in hospitals worldwide came from technology developed to computer-enhance pictures of the moon for the Apollo program. (A medical CAT scanner searches the human body for tumors or other abnormalities; the industrial version, or advanced computed tomography inspection system, finds imperfections in aerospace structures and components, such as castings, rocket motors, and nozzles.)

- Cool suits – These suits, which kept Apollo astronauts comfortable during Moon walks, are today worn by race car drivers, nuclear reactor technicians, shipyard workers, people with multiple sclerosis, and kids with a congenital disorder known as hypohidrotic ectodermal displasia.

- Cordless power tools - These appliances are one of the most successful commercial spin-offs of space-based technology.

- Diagnostic Instrument - NASA technology was used to create a compact laboratory instrument for hospitals and doctor offices that more quickly analyzes blood, accomplishing in 30 seconds what once took 20 minutes.

- Dialysis machines - Kidney dialysis machines were developed as a result of a NASA developed chemical process that could remove toxic waste from used dialysis fluid.

- Freeze-dried food – This food solved the problem of what to feed an astronaut on the long-duration Apollo missions.

- Gas Detector - A gas-leak detection system, originally developed to monitor the Shuttle's hydrogen propulsion system, is being used by the Ford Motor Company in the production of a natural gas-powered car.

- Infrared Camera - A sensitive infrared hand-held camera that observes the blazing plumes from the Shuttle also is capable of scanning for fires. During the brush fires that ravaged Malibu, CA in 1996, the camera was used to point out hot spots for firefighters.

- Infrared Thermometer - Infrared sensors developed to remotely measure the temperature of distant stars and planets, led to the development of the hand-held optical sensor thermometer. Placed inside the ear canal, the thermometer provides an accurate reading in two seconds or less.

- Insulation barriers – Barriers made of aluminum foil laid over a core of propylene or mylar, which protected astronauts and their spacecraft's delicate instruments from radiation, are used to protect cars and trucks and dampen engine and exhaust noise.

- Jewelry Design - Jewelers no longer have to worry about inhaling dangerous asbestos fibers from the blocks they use as soldering bases. Space Shuttle heat-shield tiles offer jewelers a safer soldering base with temperature resistance far beyond the 760 degrees Celsius (1,400 degrees Fahrenheit) generated by the jeweler's torch.

- Land Mine Removal Device - The same rocket fuel that helps launch the Space Shuttle is now being used to save lives — by destroying land mines. A flare device, using leftover fuel donated by NASA, is placed next to the uncovered land mine and is ignited from a safe distance using a battery-triggered electric match. The explosive burns away, disabling the mine and rendering it harmless.

- Lifesaving Light - Special lighting technology developed for plant growth experiments on Space Shuttle missions is now used to treat brain tumors in children. Doctors at the Medical College of Wisconsin in Milwaukee use light emitting diodes in a treatment called photodynamic therapy, a form of chemotherapy, to kill cancerous tumors.

- Prosthesis Material - Responding to a request from the orthopedic appliance industry, NASA recommended that the foam insulation used to protect the Shuttle's external tank replace the heavy, fragile plaster used to produce master molds for prosthetics. The new material is light, virtually indestructible, and easy to ship and store.

- Rescue Tool - Rescue squads have a new extrication tool to help remove accident victims from wrecked vehicles. The hand-held device requires no auxiliary power systems or cumbersome hoses and is 70 percent cheaper than previous rescue equipment. The cutter uses a miniature version of the explosive charges that separate devices on the Shuttle.

- Retroreflector - A hollow mirror-like instrument that reflects light and other radiation back to the source is used as a sensor to detect the presence of hazardous gases in oil fields, refineries, offshore platforms, chemical plants, waste storage sites and other locations where gases could be released into the environment.

- Synergistic coatings - A process for bonding dry lubricant to space metals led to the development of surface enhancement coatings that are used in applications from pizza making to laser manufacturing. Each coating is designed to protect a specific metal group or group of metals to solve problems encountered under operating conditions, such as resistance to corrosion and wear.

- Vacuum metallizing – These techniques led to an extensive line of commercial products, from insulated outer garments to packaging for foods, from wall coverings to window shades, from life rafts to candy wrappings, and from reflective blankets to photographic reflectors.

- Vehicle Tracking System - Tracking information originally used onboard Space Shuttle missions now helps track vehicles on Earth. This commercial spin-off allows vehicles to transmit a signal back to a home base. Municipalities today use the software to track and reassign emergency and public works vehicles. It also is used by vehicle fleet operations, such as taxis, armored cars, and vehicles carrying hazardous cargo.

- Video Stabilization Software - Image-processing technology used to analyze Space Shuttle launch video and to study meteorological images also helps law enforcement agencies improve crime-solving video. The technology removes defects due to image jitter, image rotation, and image zoom-in video sequences. The technology also may be useful for medical imaging, scientific applications, and home videos.

- Water purification technology - Technology used on the Apollo spacecraft is now employed in several spin-off applications to kill bacteria, viruses, and algae in community water supply systems and cooling towers. Filters mounted on faucets can reduce lead in water supplies.

More Spin-offs

Student Sheets

R B R O T C E L F E R O R T E R T V D C N A P P Q A M
E P A P Z D B K V A O O F R X T I I I O Y Y F K G U A
T R T L R Q Y R E T T A N R B H N E A O M A V G O T G
E O N I A K A X J C C L P F U G F C L L N T B Q Y O N
M S Q G Z N D S A S E V Q I T I R I Y S H X B I R M E
O T R I I K C E E H T L G Z X L A V S U R Q A P G O T
M H B R A S R E X O E Z A Q N G R E I I U S P W L T I
R E U G J O E R E A D Y J P Y N E D S T O P Y Z K I C
E S K V I R M D B V S N D Y K I D L M S K W U W L V R
H I W B T J S R Y Q A A F C Q V C A A L W D W L S E E
T S N F V N R N E R G L Y A M A A V C J G P M L D I S
D M V O F C R A X Y L H U W P S M O H P N U E B Z N O
E A I C Q E G I P Z B E C A M E E M I E N P Q S C S N
R T R E S C U E T O O L W P T F R E N T E L P V X U A
A E Y H P A R G O M O T D E D I A R E T U P M O C L N
R R M R F E S C Q B W Q K Z J L O E S P U L R U U A C
F I S G V E H I C L E T R A C K I N G S Y S T E M T E
N A F R E E Z E D R I E D F O O D I S F C B N R G I I
I L F K B C X V P O V V V K Q H Z M U Y O S H H X O M
N O I T A C I F I R U P R E T A W D I Y S A W I C N A
V I D E O S T A B I L I Z A T I O N S O F T W A R E G
T N E M U R T S N I C I T S O N G A I D E Y E R X Q I
Z N K C D U V A C U U M M E T A L L I Z I N G M X Z N
S Y N E R G I S T I C C O A T I N G S M B I G J S L G
S R E I R R A B N O I T A L U S N I F S T G K L R D U
C O R D L E S S P O W E R T O O L S M M L F S Q R U G

G L P Q V N D W Y D O T R A E H L A I C I F I T R A Z

Word List

Artificial Heart
Automotive Insulation
Balance Evaluation Systems
Bioreactor
Computer-Aided Tomography
Cool Suits
Cordless Power Tools
Diagnostic Instrument
Dialysis Machines
Freeze-dried Food
Gas Detector
Infrared Camera
Infrared Thermometer
Insulation Barriers
Jewelry Design
Land Mine Removal Device
Lifesaving Light
Magnetic Resonance Imaging
Prosthesis Material
Rescue Tool
Retroreflector
Synergistic Coatings
Vacuum Metallizing
Vehicle Tracking System
Video Stabilization Software
Water Purification