

Space Spinoffs

Grade Level: 5 - 8

Time Required: 30 - 45 minutes

Countdown:

- Space Spinoffs Bingo Cards
- Space Spinoffs Descriptions
- Small Paper Clips/Beans/Pennies (to cover Bingo cards)

Suggested TEKS				
Social Studies -	5.24	6.20	7.21	8.28
Science -	5.3	6.3	7.3	8.3
Suggested SCANS				
Interpersonal. Interprets and Communicates Information				
National Science and Math Standards				
Science as Inquiry, Science in Personal and Social Perspectives, Physical Science, Science & Technology, History & Nature of Science, Observing, Communicating				

Ignition:

One of the important aspects of the space program has been the technological advance we experience every day as a result of space exploration. A ‘spin-off’ is something that has resulted from experiments, inventions, or technology in space.

Liftoff:

- 1) Pass out one Bingo card per person and one sheet of words. Have students write a Spinoff word answer in each Bingo square.
- 2) Distribute chips to cover correct answers on Bingo cards.
- 3) Announce which “Bingo” game you will play – blackout (entire card covered), straight line (can be across, down or diagonal), four corners, etc.
- 4) Read the description of the spinoff and explain the history. If the student has the correct answer on his/her bingo card for what you are describing, he/she would cover the answer.
- 5) The student to get a “Bingo” calls out. Verify the answers.
- 6) Reward students with a space sticker, “Mars” or “Milky Way” candy bar, etc.

Conclusion:

After the first Bingo, you may want to play again. It is important that all items on the Spinoff Bingo cards are discussed. Are there any items on the card that are NOT actual NASA spinoffs? (Tang and Velcro are examples of items that became more popular as a result of the space program but were not invented for the space program.) Ask the students to think of something used every day that is a result of the space program. Have the students do research on Space Spinoffs to find out if their prediction is correct.

Space Spinoffs Collage

Countdown:

Photos, Magazines, Advertisements, Etc.
Poster or Tag Paper



Working in teams, have students make a Space Spinoffs collage. Students must choose a theme for their collage: Examples include: Safety, Environmental Concerns, Medical, Technology, etc. Students will use the magazines and photos to make a "collage" of Space Spinoffs that represent that theme.

More Ideas...

1. Connect to the Internet to find more Spinoffs.
<http://www.sti.nasa.gov/tto/spinoff.html>
2. Research articles in the library about space technology.
3. Bring something from home (either the actual item or a picture of the item) that is a space spinoff.



Space Spinoff Bingo

		FREE		

Spinoff Bingo Words – Select words and fill in Spinoff Bingo Card.

Home Buying	Milk Bottle Blankets	Fighting Hunger in Africa	Air Quality Monitoring	Treating Brain Cancer
Scratch Resistant Lens Coating	Cordless Products	ICEMAT	Riblets	Corrosion Resistant Coating
Improved Airport Operations	Whale Studies	Tire Recycling	Improved Vacuum Cleaners	Superfund Site Clean up
Memory Golf Clubs	Toy Gliders	Ergonomic Chairs	Sporting Goods Lubricants	Invisible Flame Imaging
Automotive Insulation	Satellite Antenna Systems	Vision Enhancement	Weather Prediction	Porpoise Safety
Breast Cancer Detection	Chair Lift	Microbe Eaters	Computer Graphics	Fertilizer
Tang	Velcro	Controller	Heart Monitor	Thermometer

Space Spinoffs

<p>Remote Sensing for Home Buying Without leaving the office, prospective buyers can view property characteristics such as percent shade of the lot, setback distances between the street and the house, visibility from the house, sites of interest, other houses, and stores in the area. <i>History:</i> NASA/Stennis teamed with Diamondhead realtor to adapt a detailed airborne remote sensing program to help homebuyers.</p>	<p>Recycled Milk Bottle Blankets These are recycled into lightweight blankets used for rescues and emergencies. They are non-allergenic, dry five times faster than wool, and are four times warmer than wool in cold/damp climates. <i>History:</i> S.D. Miler & Assoc., in conjunction with NASA/Ames, originally developed the honeycomb concept, used in plastic insulation for future spacecraft.</p>
<p>Help in the Solution to Hunger in Africa Solar Cookers International uses NASA's Surface Solar Energy data set to pinpoint locations where solar cooking would be useful. They then go teach the community how to set up and use solar cooking. This is important because many of the communities do not have fuel options, such as firewood. <i>History:</i> The Surface Solar Energy data set was generated for scientific solar energy research.</p>	<p>Air Quality Monitoring U.S. Industries can better monitor and reduce their smokestack emissions using a NASA-developed remote gas-sensing instrument. It is more reliable than past instruments. <i>History:</i> The instrument was originally developed at NASA/Langley to measure gases in the Earth's atmosphere from aircraft and spacecraft.</p>
<p>Treating Cancerous Brain Tumors in Children Using a pinhead sized LED's (Light Emitting Diodes) to activate light-sensitive tumor treating drugs, more tumors can be destroyed than with conventional surgery. The LED probe costs less than laser, can be used for hours, and remains cool to the touch. <i>History:</i> Quantum Devices, Inc. developed LED's as a light source for plant research in space.</p>	<p>Scratch Resistant Lens Coating This is used on sunglasses to prolong the life of plastic lenses. <i>History:</i> Foster & Grant recognized the applicability of the coating originally designed at NASA/Ames Research Center to protect plastic surfaces on equipment exposed to harsh environments.</p>
<p>Cordless Products Consumers use a whole range of these devices – from tools to vacuum cleaners. <i>History:</i> Black and Decker designed a cordless drill for Apollo astronauts to obtain lunar samples away from their command modules.</p>	<p>ICEMAT Ice Making System This system is used to create temporary ice rinks in amusement parks, sports arenas, dinner theaters, etc. for traveling ice shows. <i>History:</i> Adapted by Calmac Manufacturing Corporation from a solar heating system developed under contract with NASA/Marshall.</p>
<p>Riblets Used by the yacht crew of Stars and Stripes to help win the America's Cup in 1987. 3M developed this film with adhesive backing to retrofit existing aircraft. Tiny, v-shaped grooves on the surface in the direction of the air or water flow reduces skin friction, reduces drag, and cuts fuel consumption. <i>History:</i> Concept originated at NASA/Langley to improve aircraft fuel efficiency.</p>	<p>Corrosion Resistant Coating (IC 531) This was used to coat the iron skeleton of the State of Liberty during its renovation and on many other structures/landmarks worldwide. <i>History:</i> NASA/Goddard started the research program to protect the NASA/Kennedy Space Center launch structures from salt corrosion, rocket exhaust, and thermal shock. Once developed it reduced maintenance costs.</p>

Space Spinoffs

<p>Improving Airport Operations This surface movement advisor, developed by NASA, is used to reduce ground operations and bottlenecks, allowing planes to be serviced and dispatched faster. The system reduced airplane taxi times by one minute per flight, equaling 1,000 minutes per day and \$50,000 in airport operating costs. <i>History:</i> The Surface Movement Advisor was developed at NASA/Ames with the FAA.</p>	<p>Superfund Site Clean Up The U.S. Geological Survey produced maps which allow the Bureau of Reclamation and the EPA to identify and evaluate possible contamination sources as small as individual mine dumps using data from NASA Airborne Visible and Infra-Red Imaging Spectrometer. <i>History:</i> The AVIRIS instrument does non-traditional remote sensing by measuring how light is absorbed or reflected by various materials on the Earth.</p>
<p>Whale Studies Marine biologists use TOPEX/Poseidon data and measurements from the European Space Agency's ERS-2 satellite to generate circulation feature maps of the ocean. Research ships are then directed to those areas most likely to be feeding areas for this mammal. <i>History:</i> TOPEX/Poseidon is a joint NASA/French Space Agency satellite that produces ocean topographic maps every ten days to calculate speed and direction of worldwide ocean currents.</p>	<p>Tire Recycling Due to NASA's expertise in fuel handling due to launch vehicle and spacecraft operation requirements, Cryopolymers, Inc. is using NASA's expertise to make a more efficient and cost-effective method for this recycling process. <i>History:</i> NASA/Stennis used its expertise in cryogenic fuel handling for this study.</p>
<p>Improving Vacuum Cleaners Using NASA's holography equipment and advanced computer software, an improved fan blade design was developed making the machine quieter and more efficient. <i>History:</i> The NASA/Lewis holography equipment is usually used to analyze the vibration modes of jet engine fans. The Kirby Company used it to improve vacuum cleaners.</p>	<p>Safeguarding Porpoises A low-cost, easy to use acoustic pinger broadcasts a signal within the hearing range for these mammals warning them about the location of sink gill nets, to help avoid becoming tangled in the nets used by commercial fisheries. <i>History:</i> NASA/Langley developed an underwater location aid in the 1960's to help in the retrieval of NASA payloads following watery touchdowns to Earth. The Dukane Corporation modified this for commercial fishing.</p>
<p>Memory Golf Clubs Shape memory metal inserts put more spin on the ball without sacrificing distance and give the sports enthusiast greater control and a solid feel. <i>History:</i> Memry Corporation's investigation and commercialization of shape memory alloys stems from its NASA/Marshall contract to study materials for the space station.</p>	<p>Sporting Goods Lubricants Two types were developed that are environmentally safe, non-hazardous, and non-flammable. One is designed for fishing rods and one for gun cleaning. <i>History:</i> Sun Coast Chemicals originally developed environmentally safe lubricants, under sub-contract with Lockheed Martin, for use on Kennedy Space Center's Mobile Launch Platform, which transports the Space Shuttle from the Vehicle Assembly Building to the launch pad.</p>
<p>Toy Gliders Changes were made to the design of this toy to improve performance. Some of the changes were: wing location on the toy's fuselage and correct tail surface angles. <i>History:</i> Hasbro, Inc. worked with NASA/Langley because of its decades of experience in scale-model, low-speed aircraft design research and wind tunnel testing.</p>	<p>Ergonomic Chairs These are used in offices to help reduce back pain and muscle fatigue in office workers. <i>History:</i> BodyBilt created this chair based on NASA research on the effects of microgravity on the human body. The NASA Anthropometric Source Book is a compilation of NASA's findings on the effects of microgravity on the human body and came from research conducted by astronauts on Skylab and other space flights.</p>

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<p style="text-align: center;">Invisible Flame Imaging</p> <p>Fire fighters use this device to see invisible flames of hydrogen and alcohol fires during the day. The device works like a pair of binoculars. Previously, fire departments probed areas of suspected hydrogen fires with brooms to find flames. <i>History:</i> SafetySCAN used NASA/Stennis technology to visually detect presence, location, and extent of hydrogen fires. NASA's technology was developed due to hydrogen use in rocket engine test programs.</p>	<p style="text-align: center;">Automotive Insulation</p> <p>This thermal protection system is like a blanket for use on NASCAR equipment where temperatures in the cockpit can climb to 140 to 160 degrees. Tests have shown that TPS can lower the temperature by as much as 50 degrees. <i>History:</i> The TPS materials adapted by BPS Products, Inc. are used to insulate Space Shuttle equipment and other orbiting satellites.</p>
<p style="text-align: center;">Satellite Antenna Systems</p> <p>Telecommunications equipment used by television news crews and any other organization that needs reliable mobile satellite antennae systems has been developed by converting NASA/JPL equipment. The product is an improved mobile satellite antenna that is designed to be able to smoothly lock onto a specific satellite signal without fluctuations. <i>History:</i> NASA/JPL developed the prototype antenna as part of the ACTS program.</p>	<p style="text-align: center;">Vision Enhancement</p> <p>LVES is a portable image processing system that enhances and alters images to compensate for a patient's impaired eyesight. Scientists at NASA/Stennis and the John Hopkins Wilmer Eye Institute developed the LVES (often called Elvis by its users), to improve the visual capability of people with severely impaired eyesight. <i>History:</i> The LVES uses NASA technology developed for computer processing satellite images.</p>
<p style="text-align: center;">Weather Prediction</p> <p>Analysis of data from the TOPEX/Poseidon and Upper Atmosphere Research (UARS) satellites give meteorologists advanced warning of the occurrence and severity of the El Nino phenomenon. <i>History:</i> TOPEX/Poseidon studies worldwide ocean currents. The UARS Microwave Limb Sounder instrument was originally designed to study atmospheric ozone depletion but can also be adapted to study atmospheric water vapor.</p>	<p style="text-align: center;">Breast Cancer Detection</p> <p>Is an advanced method for screening breast cancer detection by detecting blood flow differences in early development. The BioScan System is used to locate and confirm the location of cancerous breast lesion by detecting the cancer's ability to detect a new blood supply. Mammograms detect calcification associated with cancer cells after they are well into development. <i>History:</i> OmniCorder Inc. used technology developed by NASA JPL.</p>
<p style="text-align: center;">Chair Lift</p> <p>Using technology developed to allow workers to get off the launch platform in the event of an emergency, a retired NASA KSC engineer developed a way to lift people from a seated position. The eZ uP device was developed for his wife who has arthritis. <i>History:</i> This NASA engineer used technology developed at NASA Kennedy Space Center for this device to help those who need a helping hand.</p>	<p style="text-align: center;">Microbe Eater</p> <p>Biological products for a cleaner and safe environment is the business of Micro-Bac. Partnering with NASA, they developed a phototropic cell for water purification. It is used on the space station and for future missions to the Moon and Mars. The material is presently used on earth in septic systems, ponds, etc. for degrading fat, oil, and fecal matter. <i>History:</i> Micro-Bac partnered with NASA Marshall for product development.</p>
<p style="text-align: center;">Computer Graphics</p> <p>A 3-D graphics tool created for the International Space Station serves double duty by helping Hollywood with special effects, animation, and colorization of old black-and-white television shows and movies. By graphically constructing models, kinematic and dynamic analysis tests can be performed specifying forces, torque, and other conditions. <i>History:</i> Dycom partnered with NASA to further enhance the TREETOPS software.</p>	<p style="text-align: center;">Fertilizer</p> <p>Although zeolite sounds like a space term, it is actually minerals used in a fertilizer. NASA has long been interested in ways to sustain plant growth in space exploration to support astronauts with oxygen, food, water, and to help recycle waste products. A highly productive synthetic soil was created to support plant growth. <i>History:</i> Boulder Innovative Technologies worked with NASA to develop superior plant growth media for spaceflight.</p>