

1: 10 NASA Spin-off Technologies Resulting From the Space Race - Top10Zen

Welcome to the home page of Spinoff, NASA's premier www.enganchecubano.com year, Spinoff highlights NASA technologies that are benefiting life on Earth in the form of commercial products.

Introduction[edit] This article may need to be cleaned up. It has been merged from 3-axis stabilized spacecraft. It is oftentimes needed so that the spacecraft high-gain antenna may be accurately pointed to Earth for communications, so that onboard experiments may accomplish precise pointing for accurate collection and subsequent interpretation of data, so that the heating and cooling effects of sunlight and shadow may be used intelligently for thermal control, and also for guidance: Types of stabilization[edit] There are two principal approaches to stabilizing attitude control on spacecraft: Propulsion system thrusters are fired only occasionally to make desired changes in spin rate, or in the spin-stabilized attitude. If desired, the spinning may be stopped through the use of thrusters or by yo-yo de-spin. The Pioneer 10 and Pioneer 11 probes in the outer solar system are examples of spin-stabilized spacecraft. Three-axis stabilization is an alternative method of spacecraft attitude control in which the spacecraft is held fixed in the desired orientation without any rotation. One method is to use small thrusters to continually nudge the spacecraft back and forth within a deadband of allowed attitude error. Another method for achieving three-axis stabilization is to use electrically powered reaction wheels , also called momentum wheels, which are mounted on three orthogonal axes aboard the spacecraft. They provide a means to trade angular momentum back and forth between spacecraft and wheels. To rotate the vehicle on a given axis, the reaction wheel on that axis is accelerated in the opposite direction. To rotate the vehicle back, the wheel is slowed. Excess momentum that builds up in the system due to external torques from, for example, solar photon pressure or gravity gradients , must be occasionally removed from the system by applying controlled torque to the spacecraft to allowing the wheels to return to a desired speed under computer control. This is done during maneuvers called momentum desaturation or momentum unload maneuvers. Most spacecraft use a system of thrusters to apply the torque for desaturation maneuvers. A different approach was used by the Hubble Space Telescope, which had sensitive optics that could be contaminated by thruster exhaust, and instead used magnetic torquers for desaturation maneuvers. There are advantages and disadvantages to both spin stabilization and three-axis stabilization. Spin-stabilized craft provide a continuous sweeping motion that is desirable for fields and particles instruments, as well as some optical scanning instruments, but they may require complicated systems to de-spin antennas or optical instruments that must be pointed at targets for science observations or communications with Earth. Three-axis controlled craft can point optical instruments and antennas without having to de-spin them, but they may have to carry out special rotating maneuvers to best utilize their fields and particle instruments. If thrusters are used for routine stabilization, optical observations such as imaging must be designed knowing that the spacecraft is always slowly rocking back and forth, and not always exactly predictably. Reaction wheels provide a much steadier spacecraft from which to make observations, but they add mass to the spacecraft, they have a limited mechanical lifetime, and they require frequent momentum desaturation maneuvers, which can perturb navigation solutions because of accelerations imparted by the use of thrusters. Voyager and Galileo , for example, were designed with scan platforms for pointing optical instruments at their targets largely independently of spacecraft orientation. Many spacecraft, such as Mars orbiters, have solar panels that must track the Sun so they can provide electrical power to the spacecraft. It logically falls to one subsystem, then, to manage both attitude and articulation. The name AACCS may even be carried over to a spacecraft even if it has no appendages to articulate. Attitude geometry This article should include a summary of Attitude geometry. September You can help by adding to it. September Sensors[edit] Relative attitude sensors[edit] Many sensors generate outputs that reflect the rate of change in attitude. These require a known initial attitude, or external information to use them to determine attitude. Many of this class of sensor have some noise, leading to inaccuracies if not corrected by absolute attitude sensors. Gyroscopes[edit] Gyroscopes are devices that sense rotation in three-dimensional space without reliance on the observation of external objects. Classically, a gyroscope consists of a spinning mass, but there are also " ring laser gyros " utilizing coherent light reflected

around a closed path. Another type of "gyro" is a hemispherical resonator gyro where a crystal cup shaped like a wine glass can be driven into oscillation just as a wine glass "sings" as a finger is rubbed around its rim. The orientation of the oscillation is fixed in inertial space, so measuring the orientation of the oscillation relative to the spacecraft can be used to sense the motion of the spacecraft with respect to inertial space. They utilize MEMS gyroscopes. Some multi-axis MRUs are capable of measuring roll, pitch, yaw and heave. They have applications outside the aeronautical field, such as: Thermal infrared sensing is often used, which senses the comparative warmth of the atmosphere, compared to the much colder cosmic background. This sensor provides orientation with respect to Earth about two orthogonal axes. It tends to be less precise than sensors based on stellar observation. Sometimes referred to as an Earth sensor. Thus, the horizon sensor provides pitch and roll measurements, and the gyro provides yaw. Sun sensor[edit] A sun sensor is a device that senses the direction to the Sun. This can be as simple as some solar cells and shades, or as complex as a steerable telescope , depending on mission requirements. Earth sensor[edit] An Earth sensor is a device that senses the direction to Earth. It is usually an infrared camera ; nowadays the main method to detect attitude is the star tracker , but Earth sensors are still integrated in satellites for their low cost and reliability. Star tracker The STARS real-time star tracking software operates on an image from EBEX , a high-altitude balloon-borne cosmology experiment launched from Antarctica on A star tracker is an optical device that measures the positions of stars using photocells or a camera. Magnetometer[edit] A magnetometer is a device that senses magnetic field strength and, when used in a three-axis triad, magnetic field direction. If spacecraft position is known then attitude can be inferred. The algorithms range from very simple, e. Typically, the attitude control algorithms are part of the software running on the hardware , which receives commands from the ground and formats vehicle data telemetry for transmission to a ground station. The attitude control algorithms are written and implemented based on requirement for a particular attitude maneuver. Besides the implementation of passive attitude control such as the gravity-gradient stabilization , most spacecrafts make use of active control which exhibits a typical attitude control loop. The design of the control algorithm depends on the actuator to be used for the specific attitude maneuver although using a simple proportionalâ€”integralâ€”derivative controller PID controller satisfies most control needs. The appropriate commands to the actuators are obtained based on error signals described as the difference between the measured and desired attitude. The PID controller which is most common reacts to an error signal deviation based on attitude as follows T.

2: GM Spins Off, Sells Stake in Hughes for \$ Billion - latimes

Satellite Antenna Systems. Transportation. Next page. New ways to bring space down to Earth is a success story from KVH Industries, Inc. of Middletown, Rhode Island.

Since , NASA has featured an average of 50 technologies each year in the annual publication, and Spinoff maintains a searchable database of these technologies. Because of interest in the reports, NASA decided to create the annual publications in color. Spinoff was first published in , [5] and since then, NASA has distributed free copies to universities, the media, inventors and the general public. Spinoff describes how NASA works with various industries and small businesses to bring new technology to the public. As of , there were over 1, Spinoff products in the database dating back to Barcodes - The barcode was invented in However, NASA developed a type of barcode that could endure in space environments. These were used by NASA and a number of spinoff products came out of those projects such as portable cordless vacuums. Microchip - The first microchip, also known as an integrated circuit, was developed in by Texas Instruments. However, in the late s, NASA partnered with a company to make a highly accurate quartz clock. Space Pen - An urban legend states that NASA spent a large amount of money to develop a pen that would write in space the result purportedly being the Fisher Space Pen , while the Soviets used pencils. While NASA did spend funds to create a pen to work in space, the project was cancelled due to public opposition, and U. Tang was used in multiple early space missions, which gave brand awareness to it. Teflon - Teflon was invented by a DuPont scientist in and used on frying pans from the s; however, it has been applied by NASA to heat shields , space suits , and cargo hold liners. Velcro was used during the Apollo missions to anchor equipment for astronauts; it is still used for convenience in zero gravity situations. Health and medicine[edit] Infrared ear thermometers[edit] Diatek Corporation and NASA developed an aural thermometer that measures the thermal radiation emitted by the eardrum , similar to the way the temperature of stars and planets are measured. This method avoids contact with mucous membranes and permits rapid temperature measurement of newborn or incapacitated patients. The MicroMed DeBakey ventricular assist device VAD functions as a "bridge to heart transplant" by pumping blood until a donor heart is available. The pump is approximately one-tenth the size of other currently marketed pulsatile VADs. It can operate up to 8 hours on batteries, giving patients the mobility to do normal, everyday activities. Eventually a range and velocity imaging LADAR was demonstrated that could be used for docking spacecraft. This technology is used by Eye surgeons to track eye movements at a rate of 4, times per second while reshaping the cornea, the clear front surface of the eye, using a laser. Advancements such as Environmental Robots Inc. Invisible braces[edit] Invisible braces are a type of transparent ceramics called translucent polycrystalline alumina TPA. These items are often included in first aid kits. Thermawing allows pilots to safely fly through ice encounters and provides pilots of single-engine aircraft the heated wing technology usually reserved for larger, jet-powered craft. Thermacool, an electric air conditioning system, uses a new compressor whose rotary pump design runs off an energy-efficient, brushless DC motor and allows pilots to use the air conditioner before the engine starts. Represented by the International Grooving and Grinding Association, the industry expanded into highway and pedestrian applications. Safety grooving originated at Langley Research Center, which assisted in testing the grooving at airports and on highways. The process has been extended to animal holding pens, parking lots, and other potentially slippery surfaces. This sensor changes color in response to contact with its target. Department of Defense to further develop the sensors for detecting chemical warfare agents and potential threats, such as toxic industrial compounds and nerve agents. IOS has sold the chemically sensitive fiber optic cables to major automotive and aerospace companies, who are finding a variety of uses for the devices such as aiding experimentation with nontraditional power sources, and as an economical "alarm system" for detecting chemical release in large facilities. Originally used for enhancing video images from nighttime videotapes made with hand-held camcorders, VAS is a tool for video enhancement and analysis offering support of full-resolution digital video, stabilization, frame-by-frame analysis, conversion of analog video to digital storage formats, and increased visibility of filmed subjects without altering underlying footage. Aside from law enforcement and

security applications, VAS has also been adapted to serve the military for reconnaissance, weapons deployment, damage assessment, training, and mission debriefing. The fuel that is left unused from a launch will become a solid, which cannot be reused but can be used as an ingredient needed to create the Demining Device flare. The Demining Device flare uses a battery-triggered electric match to ignite and neutralize land mines in the field without detonation. Further innovations include steel coatings devised to make high-rise buildings and public structures safer by swelling to provide a tough and stable insulating layer over the steel for up to 4 hours of fire protection, ultimately to slow building collapse and provide more time for escape. NASA and the National Bureau of Standards created a lightweight breathing system including face mask, frame, harness, and air bottle, using an aluminum composite material developed by NASA for use on rocket casings. The broadest fire-related technology transfer is the breathing apparatus for protection from smoke inhalation injury. These absorbers are being used as seismic shock absorbers to protect buildings from earthquakes in places like Tokyo and San Francisco. As the result of a program designed to develop a padding concept to improve crash protection for airplane passengers, Ames Research Center developed what is now called memory foam. Memory foam, or "Temper Foam", has been incorporated into mattresses, pillows, military and civilian aircraft, automobiles and motorcycles, sports safety equipment, amusement park rides and arenas, horseback saddles, archery targets, furniture, and human and animal prostheses. Its high-energy absorption and soft characteristics offer protection and comfort. That computer program led to the development of a cordless miniature vacuum cleaner called the DustBuster. In the United States, Action Products later commercialized this technique for other foods, concentrating on snack food resulting in products like Space ice cream. The foods are cooked, quickly frozen, and then slowly heated in a vacuum chamber to remove the ice crystals formed by the freezing process. Today, one of the benefits of this advancement in food preservation includes simple, nutritious meals available to disabled and otherwise homebound senior adults unable to take advantage of existing meal programs. Fossum found a way to reduce the signal noise that had plagued earlier attempts at CMOS imagers, applying a technique called intra-pixel charge transfer with correlated double sampling that results in a clearer image, this led to the creation of CMOS active pixel sensors, which are used today in all smartphone cameras and many other applications. When UV light hits titanium dioxide, it frees electrons that turn oxygen and moisture into charged particles that oxidize air contaminants such as volatile organic compounds, turning them into carbon dioxide and water. This air scrubber also eliminates other airborne organic compounds and neutralized bacteria, viruses, and molds. An air scrubber with light-induced oxidation can clean air, surfaces and clothes and nearly 30 Major League Baseball teams now have this scrubber technology in their facilities. This system turns wastewater from respiration, sweat, and urine into drinkable water. By combining the benefits of chemical adsorption, ion exchange, and ultra-filtration processes, this technology can yield safe, drinkable water from the most challenging sources, such as in underdeveloped regions where well water may be heavily contaminated. As a result, SunPower Corporation created advanced silicon-based cells for terrestrial or airborne applications. The PRP uses thousands of microcapsules—tiny balls of beeswax with hollow centers. Contaminating chemical compounds that originally come from crude oil such as fuels, motor oils, or petroleum hydrocarbons are caught before they settle, limiting damage to ocean beds. John Deere licensed the software and used it to develop self-driving farm equipment. Alain Gachet founded Radar Technologies International RTI in to use satellite generated data to identify probable locations of precious metals and during its use found it could also detect water. It has been used to design everything from Cadillacs to roller coaster rides. The menu allows the user to simply enter the dinner time, and the oven automatically switches from refrigeration to the cooking cycle, so that the meal will be ready as the family arrives home for dinner. The content is accompanied by short descriptions about the Data and why it is important. Software catalog[edit] NASA released a software catalog in that made over 1, pieces of software available to the public at no charge. NASA developed a solid lubricant coating, PS, which is deposited by thermal spraying to protect foil air bearings. PS lowers friction, reduces emissions, and has been used by NASA in advanced aeropropulsion engines, refrigeration compressors, turbochargers, and hybrid electrical turbogenerators. ADMA Products has found widespread industrial applications for the material. Today, the same scientist and Luna Innovations are using a digital

adaptation of this same device for non-destructive evaluation NDE of railroad ties, groundwater analysis, radiation, and as a medical testing device to assess levels of internal swelling and pressure for patients suffering from intracranial pressure and compartment syndrome, a painful condition that results when pressure within muscles builds to dangerous levels. HACCP is designed to prevent food safety problems rather than to catch them after they have occurred. Due to both benefits, the James Webb Space Telescope uses a lot of gold for its mirrors. This NASA technology transfer to Epner gave the company a reputation for durable gold coatings and the Academy of Motion Picture Arts and Sciences was having to replat Oscar statues that had faded over time. Epner has contracted with the Academy to gold plate all future Oscars while offering a lifetime guarantee to replat, for free, any faded Oscar; its gold plating has lasted for decades in space without fading.

3: EPO - Space and satellites

History of the Spinoff publication. Spinoff is a NASA publication featuring technology made available to the public. Since , NASA has featured an average of 50 technologies each year in the annual publication, and Spinoff maintains a searchable database of these technologies.

4: Satellite Imagery Sheds Light on Agricultural Water Use | NASA

The dream of reaching the stars brought about the space-race - a concerted effort to land on the moon, orbit a satellite around the Earth, and a whole lot more. These goals led to many spin-off technologies being developed along the way; to.

5: What could cause an orbit to fail?

Virgin is bringing in Dan Hart, the former vice president of government satellite systems at Boeing, to serve as the new president of Virgin Orbit.

6: Space Spin Off, TV Satellite Dish by Maria Romano on Prezi

A down-to-Earth look at space and satellite technology. Space and satellite technology have become the backbone of modern digital life, helping us to keep in touch, find our way, stay safe and monitor the Earth for changes that could help or harm the environment and society.

7: NASA spinoff technologies - Wikipedia

Virgin Orbit, which focuses on the small-satellite launch services that will be provided by LauncherOne and its Cosmic Girl carrier airplane, a modified Boeing jet.

8: Attitude control - Wikipedia

Satellite Television Without the technology pioneered by NASA they used to fix errors in spacecraft signals, we would be unable to reduce and correct scrambled pictures and sound in satellite television signals.

9: EchoStar now called Dish Network, spins off Sling Media - CNET

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