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SATOP

# SATOP

# 3-2-1



# S A T O P

SPACE ALLIANCE TECHNOLOGY OUTREACH PROGRAM



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**JACOBS**

LOCKHEED MARTIN



Photo Credit: NASA



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### SATOP Texas Team

**Bob Payne**  
Director

**Ryan Page**  
Project Engineer Intern

**Britney Halewyn**  
Administrative Assistant

Through its very nature, the Space Alliance Technology Outreach Program (SATOP), a part of the Bay Area Houston Economic Partnership, creates success stories. Small business owners seek SATOP's assistance to overcome technical challenges in completing the design of new and innovative products. Our Alliance Partners have the just the right solutions to keep the product development process moving forward. Five such stories are featured in this issue of 3-2-1 SATOP.

M. J. Payne was an operator in one of Houston's many plants for 15 years before retiring and forming a company that offers safety items for industry. Payne's visual sight flexible gas flow indicator monitors the flow of gas in a vessel purging. The invention allows workers to easily see, from a distance, where gas may be flowing or leaking, potentially saving lives.

The expertise of a SATOP Alliance Partner allowed for faster development of Greg Bruce's product, which he eventually demonstrated on the Home Shopping Network. It wasn't a quick journey, however, since it took 10 years for Bruce to take his cardio exercise poles from concept to the HSN stage.

Babies who are born prematurely or with medical problems often require a rapid diagnosis. The NeoRay Portable Digital Imaging System emits half the radiation dose of the X-ray technology currently in use in most hospitals today. A positioning system for the NeoRay, currently under development, will offer a major breakthrough in portable X-ray technology.

Rather than undergoing invasive back surgery for persistent pain, Joe Gomez, Jr., developed a therapeutic cushion to ease his symptoms. Over the past seven years, Gomez has improved the cushion and developed a varied product line for his Spine Buddy™. Now he is expanding his marketing effort to include the military.

A three-wheeled toy bike belonging to John Caldwell's son inspired him to create his Bicep Bike prototype. Sitting just 9 inches off the ground, the rider moves with a natural, rowing motion. Caldwell says that the bike develops the upper body rather than the legs — no more spaghetti arms!

Technical challenges offer SATOP's Alliance Partners the opportunity to make a difference in the lives of the entrepreneurs they assist. The inventions and new products often result in job creation and the potential to improve the lives of many. It's definitely a win / win relationship!

Sincerely,

Bob Payne, Director  
SATOP Texas



### TEXAS SATOP CENTER

At the Bay Area Houston Economic Partnership  
[www.bayareahouston.com](http://www.bayareahouston.com)  
Bob Payne, Program Director — 832.536.3255



### NEW YORK SATOP CENTER

At The Tech Garden, an affiliate of CenterState  
[www.thetechgarden.com](http://www.thetechgarden.com)



### FLORIDA SATOP CENTER

At the Technological Research and Development Authority  
[www.trda.org](http://www.trda.org)



### NEW MEXICO SATOP CENTER

At the Regional Development Corporation  
[www.rdcnm.org](http://www.rdcnm.org)

### About SATOP

The NASA-funded Space Alliance Technology Outreach Program (SATOP) provides small businesses with up to 40 hours of FREE technical assistance through the expertise of the U.S. Space Program. Aerospace contractors, NASA field centers, universities and colleges join SATOP as Space Alliance Partners and donate time and expertise to help solve technical challenges for small businesses. For more information about SATOP, or to request technical assistance, please visit [www.SpaceTechSolutions.com](http://www.SpaceTechSolutions.com).

### Former Plant Operator Creates New Career Inventing Safety Items For Industry

Nitrogen is colorless and odorless. It's very dangerous, too. Many people assume that nitrogen is not harmful, because 78 percent of the air we breathe is nitrogen gas. However, nitrogen is safe to breathe *only* when mixed with the appropriate amount of oxygen. Breathing an oxygen deficient atmosphere can have serious and immediate effects, including unconsciousness after only one or two breaths.

Workers in industrial plants, such as refineries and petrochemical plants, are familiar with the potential danger this gas presents, since it's used in plant turnarounds to clean the inside of equipment.

Nitrogen purges air from equipment prior to introducing material, or it can be used to purge flammable or toxic material prior to opening equipment for maintenance. In turn, the nitrogen then has to be purged from the equipment. Thus, a worker who is carrying out a vessel purging and/or inerting operation or a follow-up inspection in a typical petrochemical plant, or somebody who is even standing near a vessel that has nitrogen purging going on, is at risk.

Before retiring in June 2012, M.J. Payne was a plant operator for 15 years. Payne knew there had to be a safer way to monitor the flow of dangerous gas. For the past few years, Payne has been working to perfect the invention, a visual sight flexible gas flow indicator, which would monitor the flow of gas in a vessel purging. With permission from Lee College in Baytown, Texas, Payne was able to use its process training unit to test both the flow and visual effectiveness of the device. There are a variety of sight indicators on the market, but each requires a person to be relatively close to the device in order to observe flow within the pipe on which it is mounted.

Payne's original prototype vaguely resembled a Chinese kite. This design allowed gas to escape too easily, though. One of Payne's associates, Tommy Hathaway, learned about SATOP through Joseph Decker at the University of Houston Fort Bend County Small Business Development Center. After calling the Texas SATOP Center, Payne was put in contact with SATOP Alliance Partner Mike Hamm of es2technologies, inc., in Houston. Hamm offered design recommendations and constructed a crude prototype. Payne incorporated further improvements, applied for a patent on the invention about one year ago, and then reapplied

for a patent through an agent several months later.

Payne's visual sight flexible gas flow indicator overcomes the problem of being near a vessel that is being purged. It allows workers to easily see, from a distance, where gas may be flowing or leaking, thereby reducing the risks of inhalation exposure or asphyxia. Basically, Payne explains, the invention looks like a small windsock approximately 6 inches long. It is a sleeve made from flexible, water repellent material that is shaped like a cone with its tip cut off. A threaded fitting is secured to the large end, which is attached to a conduit or bleeder valve of a vessel or piping system through which a gas to be monitored flows. The flexible sleeve normally hangs loosely in a vertical position when no gas is flowing through it. When gas is flowing, the sleeve becomes fully extended in a horizontal position, which can be seen from approximately 100 ft. away.

Payne also points out that the indicator is simple in construction, inexpensive to manufacture, rugged and reliable. Additionally, it can be installed quickly, made with various bright colors using reflective material, and imprinted with letters, numbers, symbols, or combinations thereof. The numbers would prove useful in integrating the device

into existing lockout tagout systems that allow workers to document the location and status of a purge, an open bleeder valve, and other gas flow or leakage problems and potential hazards.

Payne doesn't plan on manufacturing the visual sight flexible gas flow indicator but intends to sell the patent instead. This allows Payne to concentrate on other inventions. Payne has formed a company, Industrial Safety Solutions, Inc., through which safety items for industry will be offered.

Payne credits SATOP for its help saying, "Mike gave me the right advice at a critical point in the process. It was just the boost I needed to complete my prototype."



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### Texas Inventor Takes 10-Year Journey From Galveston To Set Of Home Shopping Network

On September 25, 2012, inventor Greg Bruce walked onto the set of the Home Shopping Network with his Axer Sport Cardio Poles strapped to his ankles. HSN viewers had no idea that it took Bruce over a decade to make it there from his home in Galveston, Texas. Bruce's story begins in early 2001. Owner of a fencing company, he got plenty of exercise during the day, but he also enjoyed doing the Tae Bo workouts shown on Billy Blanks' DVDs. When Bruce's hips started to hurt from the Tae Bo exercises, he wanted to find a different way to stay in shape.

Bruce knew through lots of experience the kind of workout a posthole digger provides. He decided to design something that would mimic the digging without placing so much stress on the body. He put his thoughts on paper one night, which resulted in telescoping poles that became the foundation of his product. Bruce also included a big power band that could slip around the poles. The next day he purchased items off the shelf and had his first prototype.

The telescoping poles provided a lot of exercise versatility when used while standing in place. Then one day Bruce observed power walkers on Galveston's seawall and realized that the poles would also provide a great workout when walking. They could simulate the motion used by cross country skiers but with low impact to the body.

A rubber O-ring is used to seal the air between each telescoping pole, and a type of lubrication allows the inside pole to slide easily within the outside pole. However, Bruce ran into difficulty when the lubrication began transferring onto the user's clothing.

He needed help in solving the problem, and turned to SATOP. Bruce had learned about the free program through the Houston Inventors Association. He had been spending about \$7,000 per year to market his product, and free sounded good to him. However, he was initially leery of the program. "As an inventor, I have become suspicious of anyone claiming to help, and 'free'

is one of the scariest words I've heard," Bruce admitted. He said that it took some time for him to trust the program.

Bruce explained that Wesley Forbes, SATOP project engineer, took the time to make him comfortable with the program. Forbes arranged a meeting between Bruce and SATOP Alliance Partner Ed Sarlls with The Boeing Company. Sarlls visited Bruce in Galveston, taking samples of different lubrication methods. He also provided O-ring /seal recommendations and information for suppliers of the recommended seal.

Through much trial and error, the lubrication now stays at the O-ring and doesn't transfer onto the pole and then onto clothing. Bruce said, "The work that Ed and I did together filled some holes in the puzzle, which allowed for faster development of the product. SATOP is one of the few organizations which persisted in helping me to develop this product. Rather than lip service, that is so prevalent in this business, Wesley stayed on this project through emails and inquiries of my progress. I have recommended SATOP to others on EdisonNation.com, my favorite inventors' forum."

Edison Nation, according to Bruce, is an invention development company. It creates a relationship between inventors and marketers / manufacturers. Edison Nation now owns the license to Bruce's invention and markets the product under the name Axer Sport Cardio

Poles Air Resistance Exercise System. Bruce receives royalties from the sale of the product and is still involved in marketing it. He relates that his exercise system is great for beginners to intermediates. The poles use air resistance to help engage and train the body through the use of three resistance settings: low, medium, and high. His DVD shows a variety of workouts that can be done indoors or outside.

Bruce believes that the cardio poles can be further improved and continues to work to take them to the next phase of development.

[www.hsn.com/health-fitness/axer-sport-cardio-poles-air-resistance-exercise-system](http://www.hsn.com/health-fitness/axer-sport-cardio-poles-air-resistance-exercise-system)



**Greg Bruce**

# NeoRay Portable X-Ray System Dramatically Reduces Radiation Exposure For Tiniest Of Newborns

In a perfect world, healthy babies are born kicking and screaming their way into their parents' arms. As we all know, this world is not perfect, and all too often babies are born prematurely or with medical problems that require a rapid and accurate diagnosis.

In development since 2007, the NeoRay Portable Digital Imaging System is a valuable diagnostic tool that will soon be available to neonatal doctors. It is a highly portable digital radiography (DR) system that can be easily moved from incubator to incubator or into the delivery room as needed. The NeoRay features a flat panel receptor offering a high quality image yet allows for a drastic reduction in radiation exposure to generate images as compared to computed radiography (CR) technologies.

Less radiation – these are two key words when applied to the tiniest of newborns. It is critical in the early days of life. Terry Ancar, president of 5 Star Medical LLC and developer of the NeoRay system, explained that most hospitals use X-ray technology that requires twice the radiation dose as his system and can take up to 10 minutes longer for the Neonatal Intensive Care Unit staff to receive images. He wanted to improve his system further by finding a way to line up the X-ray source and the digital plate placed under an infant when taking X-rays. If not lined up properly, the X-ray must be retaken, exposing the baby to additional radiation.

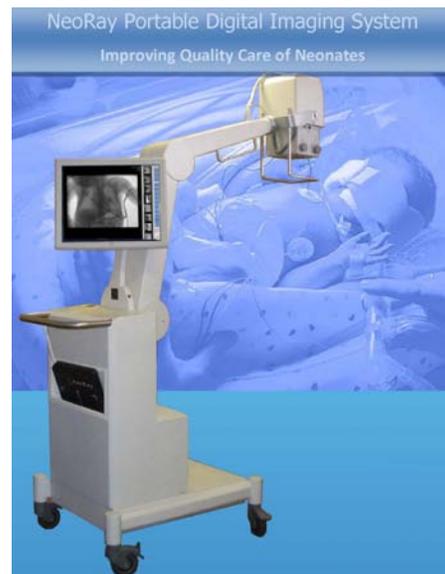
Referred to Texas SATOP by the Small Business Development Center at Louisiana State University, Ancar, from Jefferson, La., submitted two Requests for Technical Assistance. Design by Analysis, a SATOP Alliance Partner, performed a stress analysis on the NeoRay's X-ray tube support articulating arm. Alicia Baker, SATOP project engineer, referred Ancar to SATOP Alliance Partner Bence Bartha with United Space Alliance at Kennedy Space Center to find a solution for the positioning system that Ancar wanted. Bartha researched several technology options. After a short period of time, the engineer sent Ancar a video of his proposed solution, which they discussed through a conference call. Bartha suggested using sensors to work with a microcontroller that indicated when the X-ray source and digital plate were lined up correctly. Ancar stated, "SATOP and its Alliance Partners have been very helpful with engineering and design review for NeoRay."

After completion of the SATOP work, Ancar contracted with another Alliance Partner to develop a working prototype of the system that would meet the required medical standards. When finished and approved, the positioning system will eliminate the need to retake an X-ray due to misalignment. The system also has the potential of taking both a still X-ray and a "flouro" X-ray. Flourosocopy is a technique for obtaining "live" images of a patient. It is like an X-ray TV camera. This would allow the NICU staff to see an X-ray procedure in real time at the side of the incubator, which is a major breakthrough in portable X-ray technology.

At the end of November, Ancar exhibited his NeoRay DDR 2520 at the 98<sup>th</sup> Scientific Assembly and Annual Meeting of the Radiological Society of North America, one of the world's largest X-ray equipment conventions. In early December, he demonstrated the NeoRay at Alfred I. duPont Children's Hospital, one of the largest NICUs in the country. The hospital is very interested in the positioning system and the possibility of having a system capable of flouro X-rays.

Ancar reports that he has several large equipment manufacturers interested in adding NeoRay to their international product line. His next steps will be to ensure that the working prototype of the positioning system gets completed as quickly as possible as well as selecting the best international X-ray equipment manufacturers to distribute NeoRay.

In a unique twist of fate, Ancar's son and his wife became the parents of two beautiful babies, a boy and a girl, in late October. The first grandchildren for the Ancars, the twins were born prematurely in the same hospital where he demonstrated his NeoRay system in January 2012. As of this writing, both children are in the NICU and making very good progress.



# Spine Buddy™ Inventor Credits SATOP For Exceeding His Expectations

The familiar adage that necessity is the mother of invention certainly holds true for Joe Gomez, Jr., from Humble, Texas. Creator of Spine Buddy™, Gomez sought an affordable, non-surgical solution for his persistent neck pain and stiffness after physical therapy failed. A former thoroughbred jockey in his teens, Gomez started suffering neck spasms due to the pounding he got from the racetrack. Car accidents worsened his condition, as does a 25-year career in automobile finance management, where he spends hours seated at a desk.

Approximately seven years ago, opposed to undergoing invasive back surgery, Gomez came up with the idea of inventing a therapeutic cushion to ease his symptoms. He had learned much about spinal decompression through treatments he received. However, the treatments were expensive, they took time away from work, and they didn't provide the long-term pain relief he needed.

Gomez worked on his idea during the bits and pieces of time he could find outside of work and family obligations, and, eventually, Spine Buddy™ became a reality. Using Spine Buddy™ daily, Gomez's symptoms – tension, stiffness, and an urge to twist his head around in order to "crack" his neck, which could potentially cause additional problems – quickly diminished. He hasn't required the surgery his doctor thought would be inevitable, and he hasn't needed additional physical therapy.

Gomez explains that Spine Buddy™ features a t-shaped cushion inside a durable, washable cover. Used properly, it is most effective with daily use. While a person lies down on or leans back against the cushion, it relaxes and decompresses the neck and back, helping with symptoms related to accidents and injuries, daily stress, sleeping on an inadequate or old mattress, poor posture, and aging.

Gomez obtained a trademark for Spine

Buddy™ and also a patent. Several more patents are pending. Two years ago, he felt it would be beneficial to have an ergonomics assessment conducted. His goal was to improve the product and then attract investors to help mass produce and expand the product line. Gomez knows that a potentially huge market exists in the medical, military, airline, and auto industries. He feels that his therapeutic cushions can prevent injuries, save on rehabilitation costs, and create jobs.

Carey White, procurement director at the University of Houston – Downtown, knew about SATOP, since he had worked with the University of Houston's Small Business Development Center previously. He referred Gomez to Texas SATOP.

Gomez worked with SATOP Alliance Partners Jeffrey Medlen and Mike Hamm of es2 technologies, inc., who provided recommendations for improvement and determined that certification of his product would not be necessary. They also provided a list of retailers that could sell Spine Buddy™.

Gomez stated, "Everyone connected with SATOP was so professional and helpful. They even did a thorough follow-up. My expectations were definitely exceeded."

Gomez has formed a company, International Neck & Back Cushion Enterprises LLC through which to manufacture and market Spine Buddy™. He's developed a product line geared specifically for military use and is focusing on breaking into that market. Military rules and regulations make this very challenging. However, Gomez has arranged to donate several modified cushions to an organization in San Antonio called Soldiers Angels. He will also be delivering 200 of his Spine Buddy™ cushions to Fisher House while there. Similar to Ronald McDonald House, there is at least one Fisher House, available without charge, at every major military medical center to assist families. It is Gomez's wish that the families will share the cushions with their loved ones in the hospital to help relieve their discomfort.



[www.myspinebuddy.com](http://www.myspinebuddy.com)

## Creative Concept In Bike Design Eliminates 'Spaghetti Arms'

Inspiration arrives in many forms. For John Caldwell, it rolled into town on his son's three-wheeled Big Wheel. Many times inspiration is followed by sweat equity. Caldwell has invested considerable time and money over the past 10 years in his Bicep Bike, a different looking, but cool, bike for adults that resembles a low-slung tricycle. Caldwell stated, "I took existing technology and put it together in a new, creative way."

Like most inventors, Caldwell could only work part-time on his bike, because his day job kept him busy. For almost 35 years, he worked as a CPA at JCPenney's corporate headquarters. Caldwell took an early retirement package in May 2012. He can now devote his full attention to the bike, custom building each one to buyers' specifications.

The original Bicep Bike prototype, garage-built in Plano, Texas, didn't have speeds, coasting, or brakes. That didn't stop Caldwell from riding it around his neighborhood. The bike drew a lot of attention, and he kept refining it. Caldwell has ridden over 2,000 miles, including five 26.2 mile marathons. The SATOP version is prototype #7.

Caldwell holds two patents on the bike. He noted that getting a patent costs \$8,000 to \$10,000. His goal is to sell the manufacturing rights, thereby getting a royalty on each sale. However, even with his design improvements over the years, he felt that the bike, with its industrial-looking rectangular frame, just wasn't sporty enough to interest potential buyers. He had circular tubing, but he just couldn't make it work.

Caldwell belongs to the Texas Inventors Association, and a SATOP representative gave a presentation during a meeting. About two years ago, he decided to use the free program and was put in contact with SATOP Alliance Partner Bob Avalone with Design by Analysis, Inc. Avalone provided design recommendations, which Caldwell incorporated into his latest prototype. Caldwell said, "I built all my earlier prototypes as a complex rectangle. Bob had the experience and insight to build the bike as two rectangles on top of each other. It's easier to build and **much** easier to modify. My original frame was rectangular aluminum tubing; Bob's design had round tubing for a sportier look."

Just what does the Bicep Bike look like now? Caldwell, like a kid with a new toy, is happy

to describe it. The rider sits in a comfortable, ventilated hammock. The seating position can be adjusted six different ways to match an individual's arm, leg, and foot length. The current model will fit riders from 5'3" to 6'4". The motion is very smooth and low-impact.

Sitting just 9 inches off the ground on a pivoting seat, the rider propels the bike forward by cranking handles connected to a five-speed transmission with two moving parts. When you push or pull the handles, you go forward. The rider moves with a natural, rowing motion. Separate, foot-activated brakes turn the rider left and right. The rider can even pivot on one wheel by locking the wheel with the foot brake and cranking with the opposite arm. Commercial hand cycles sell for \$2,500+ and have a turning radius of about 18 feet. The bike's transmission is shifted with a thumb trigger that moves a pin from one hole to another on a metal crank arm. The shorter the crank arm, the faster the speed. Caldwell relates, "It's a totally new concept. This is a cycle for developing your upper body – no more spaghetti arms."



**John Caldwell**

He has high praise for SATOP saying, "I tell my son that to succeed in life, surround yourself with intelligent, hard-working people. That describes SATOP. I am a guest speaker for engineering classes at the Plano Independent School District. I talk about SATOP and its enthusiasm for solving problems."

YouTube features earlier prototypes of the Bicep Bike in action. The key words are: bicep bike gear, and the URL is <http://youtu.be/4iAYvXPYrec>.

[www.bicepbike.com](http://www.bicepbike.com)

# ALLIANCE PARTNERS

S A T O P

## SPACE ALLIANCE TECHNOLOGY OUTREACH PROGRAM

Our Alliance Partners include NASA Centers; NASA contractors, sub-contractors, and suppliers; and national laboratories and universities that participate in NASA research. Alliance Partner engineers are matched with SATOP requestors to help them overcome technical challenges.

### PLATINUM ALLIANCE PARTNERS



**JACOBS**



### GOLD ALLIANCE PARTNERS



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