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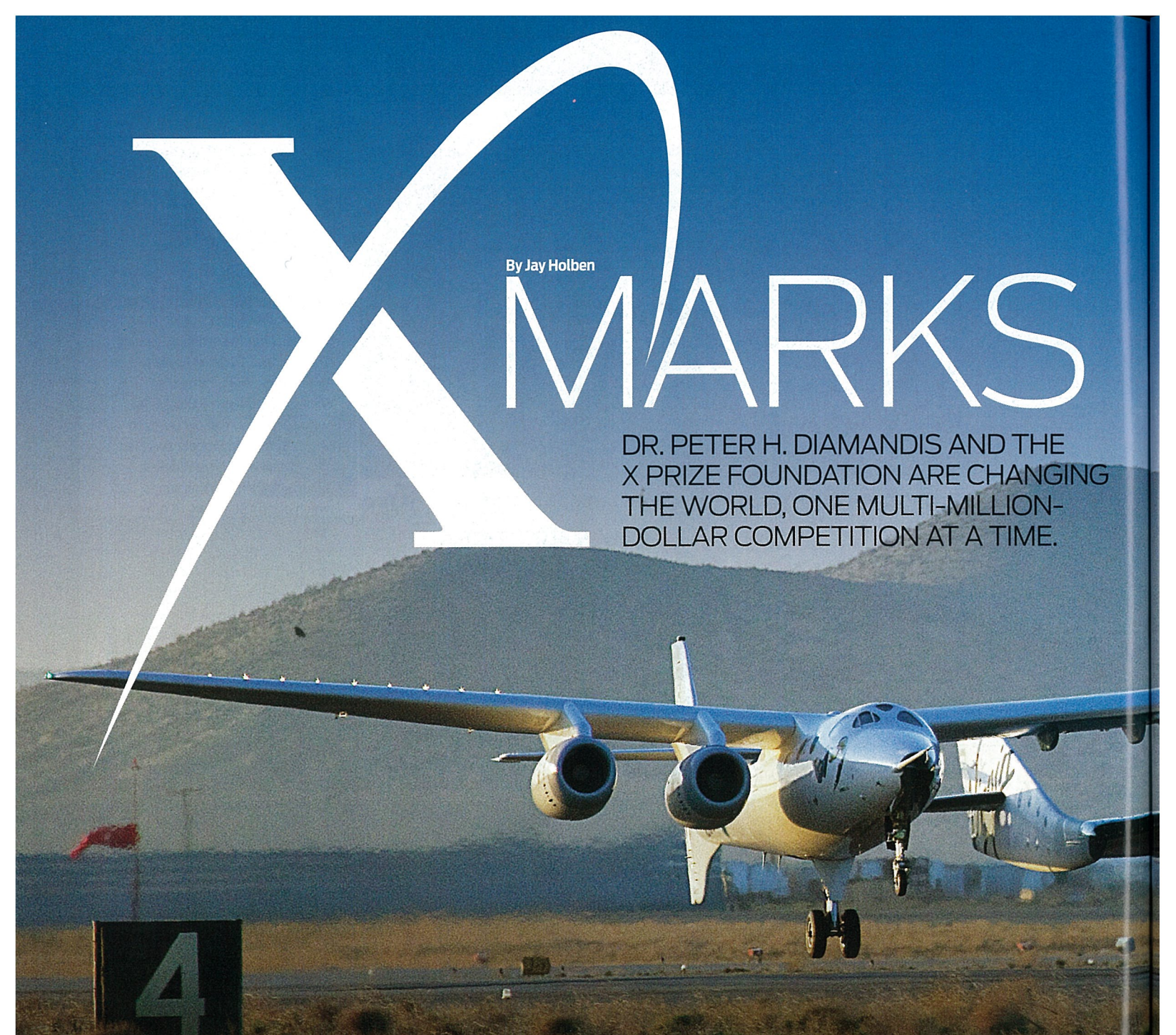
By Jay Holben

X MARKS

DR. PETER H. DIAMANDIS AND THE X PRIZE FOUNDATION ARE CHANGING THE WORLD, ONE MULTI-MILLION-DOLLAR COMPETITION AT A TIME.



We've all had crazy ideas and fantasies about taking steps to right a significant wrong or cure a horrible injustice. But how many of us have had dreams about changing the world? Dreams that seem too big to handle? A little crazy or insane? "I'm fond of saying, 'The day before something is truly a breakthrough, it's a crazy idea,'" offers Dr. Peter H. Diamandis, a man not only familiar with crazy ideas, but who has a penchant for making them come true. "If it wasn't a crazy idea the day before, then it isn't a breakthrough."

Diamandis was born in the Bronx in 1961, the year JFK challenged Congress to land a man on the moon and return him safely within the decade — a crazy idea that was realized by NASA and the Apollo 11 crew on July 20, 1969. "My passion for space came at the age of 10 in my 4th grade science class in Mount Vernon, New York," Diamandis recalls. "I was a shy kid with a knack for science and math. One day, my friend Kenny was giving a report on the planets. At the same time, high above our heads, the drama of Apollo 13 was unfolding. In that moment, I felt like there was nothing more important in the world than exploring space."

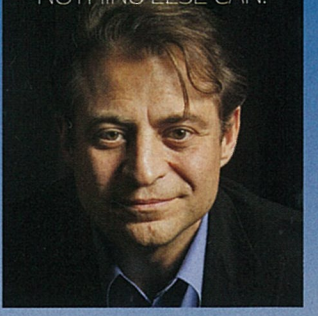
Diamandis' dream led him to MIT, where he began studies in biology and physics. "I realized, other than Air Force test pilots, NASA was accepting more physicians into the astronaut program than any other profession," he says. "In 1983, I applied to and was accepted to a medical program offered jointly by Harvard and MIT."

Diamandis attended Harvard for three years before returning to MIT to get his undergraduate and graduate degrees in aerospace engineering and then returned to Harvard to finish his M.D.

Passionate and driven, Diamandis changed the course of his dream. "I realized that my chances of being a NASA astronaut were lower than my chances of being an NBA All-Star," he attests. "Well, I'm 5'5" so that wasn't an option."

While working on his pilot's license, Diamandis came across the book "The Spirit of St. Louis," Charles Lindbergh's account of his famous solo flight across the Atlantic in 1927. Within the pages of Lindbergh's tale, Diamandis learned that

"I THINK INCENTIVE PRIZES ARE ABLE TO DRIVE BREAKTHROUGHS IN A WAY THAT NOTHING ELSE CAN."



THE FUTURE

Lindbergh's inspiration for the flight came from the Orteig Prize, a $25,000 award for the individual who could fly an between New York and Paris. It was a contest that inspired Lindbergh's feat in aviation and made commercial flight a reality instead of a dream.

"I thought, 'What an efficient way to cause a breakthrough!'" Diamandis exclaims. "And being this 9-year-old kid at heart who wanted to fly in space, that was an amazing opportunity to create this space flight prize."

That inspiration started a five-year journey for the doctor/aerospace engineer/geneticist/dreamer, and he eventually happened on an Iranian brother and sister duo, Amir and Anousheh Ansari, who saw the potential of his dream. Thus, the Ansari X PRIZE was born: a $10 million competition to motivate private enterprise to create a viable manned spaceflight vehicle that could hold three people and break Earth's orbit to reach a height of 100 kilometers (62 miles) above the surface of the planet — and return safely to earth — *twice* in two weeks.

This seemingly impossible challenge inspired 26 teams from seven different countries to take their shot. In 2004, Scaled Composites, a company funded by Microsoft billionaire Paul Allen, wound up winning with its SpaceShipOne, and the technology was then purchased by Richard Branson to create Virgin Galactic.

The success of this impossibility inspired Diamandis to expand the X PRIZE Foundation to create more prizes, more challenges and tackle more impossible dreams.

Next up was the Northrop Grumman Lunar Lander X CHALLENGE, a competition to create a vertical takeoff and vertical landing (VTVL) vehicle for lunar exploration.

■ TAKE OFF: Based on the X Prize-winning design by Scaled Composites, Virgin Galactic's larger passinger spacecraft (above) is one of the foundation's biggest success stories.

The prize spanned three years, from 2006 to 2009, and encompassed several levels of testing that eventually required the wining team to launch a vehicle, fly it laterally, land it on a moon-simulated surface (complete with craters and boulders), refuel it, launch it again, fly laterally back to its origin and land it safely on a landing pad. Masten Space Systems, closely followed by Armadillo Aerospace, won the $1 million prize.

Still ongoing, there are currently 26 teams vying for the larger Google Lunar X PRIZE, a $30 million award for the

SPACE SHOTS

DIAMANDIS REACHES FOR THE STARS.

IN ADDITION TO CREATING THE X PRIZE FOUNDATION, Peter H. Diamandis has started a number of companies in the space arena, including Zero Gravity Corporation, which offers corporations, scientists and the general public access to experience weightlessness in zero gravity through parabolic flights. He has also formed Space Adventures, which has flown eight civilians into space to the International Space Station, and Rocket Racing League, devoted to developing a new sport that offers the thrill of Indy car racing and the intrigue of rocket flights. He also founded the International Space University, which offers a space studies program and two accredited masters of space studies degrees at its campus in Strasbourg, France.

Recently, Diamandis announced a new venture even more "out there" than his other space dreams: Along with Eric Anderson, his partner in Space Adventures and Zero G, they announced Planetary Resources, a company dedicated to accelerating the space frontier and looking for precious resources by mining near-earth asteroids — what Diamandis calls the "low-hanging fruit" of resources in the solar system. The enterprise is backed by Larry Page and Eric Schmidt of Google fame, industrialist Ross Perot, Jr., and director James Cameron, who's onboard as an advisor. — *Jay Holben*

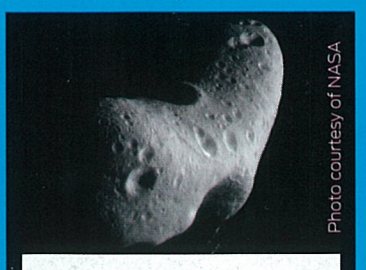


Photo courtesy of NASA

■ Rock Hounds: Planetary Resources plans to mine such near-earth asteroids as Eros, seen here in a shot from the Spitzer Space Telescope.

first team to send a robot to the moon that can travel 500 meters over the lunar surface to send photos, video and data back to Earth by 2015.

Although it may seem like X PRIZE has set its sights only on the stars and heavens, the X PRIZE Foundation's manifesto is to bring about radical breakthroughs for the benefit of humanity through high-profile competitions that motivate individuals, companies and organizations across all boundaries to solve the grand challenges that are currently restricting humanity's progress. In addition to space exploration, they're creating prizes in ocean exploration, life sciences, energy and environment, education and global development.

The Board of Trustees for X PRIZE reads like a who's-who of technology and information: James Cameron, Arianna Huffington, Ray Kurzweil (one of the leading inventors of our time: developer for the first CCD flat-bed scanner, first print-to-speech machine, first grand piano music synthesizer, etc.), Elon Musk (co-founder of PayPal and Tesla Motors), Larry Page (co-founder of Google), Ali Velshi (CNN chief business correspondent and

"THE BEST WAY TO PREDICT THE FUTURE IS TO CREATE IT YOURSELF!"

anchor of *Your Money* and *World Business Today*), Richard Garriott de Cayeux (the creator of the Ultima computer series), James M. Gianopulos (chairman and CEO of Fox Filmed Entertainment) and many more.

After starting the Google Lunar X PRIZE, the Foundation broke away from space exploration to concentrate more on the issues that are of dire concern right here on terra firma. Progressive Automotive Insurance got behind the next X

PRIZE: a competition to create a mainstream vehicle that was production-ready and capable of 100 miles per gallon energy equivalent (MPGe). Soon, 43 teams with 53 different designs passed the initial design phase of the competition, showing, quite clearly, that there was considerable interest from the private sector (beyond the big car manufacturers, which elected not to participate in the competition) to rethink how efficient mainstream personal transportation can be.

Among the competing teams of entrepreneurial mavericks were two universities, Cornell and Western Washington and a team from West Philadelphia High School, which had *two* cars in competition. The prize culminated in an 11-day performance and speed evaluation of the finalists at the Michigan International Speedway in Brooklyn, Mich.

In addition to the competition, X PRIZE launched an educational program funded by a $3.5 million grant from the U.S. Department of Energy to reach out to students from K-12 to help them learn about advanced vehicle technologies, energy efficiency, climate change, alternative fuels, and the science, technology, engineering and math (STEM) behind efficient vehicle development.

The prize also included a student design competition called DASH+ that challenged high schools to design the dashboard of the future by incorporating feedback mechanisms to help drivers maximize fuel efficiency and reduce environmental impact.

Following the Progressive competition and in the wake of the BP Deepwater Horizon oil spill in the Gulf of Mexico in 2010, X PRIZE launched the Wendy Schmidt Oil Cleanup X CHALLENGE to inspire a significant advancement in oil cleanup technology — which was, unfortunately, proven to be antiquated and inadequate to disastrous and catastrophic degrees by the BP spill. A $1 million prize was awarded to Elastec/Marine American for their efficient ability to remove oil from the water. Testing for the competing teams took place at the National Oil Spill Response Research & Renewable Energy Test Facility called OHMSETT quietly housed at the U.S. Naval Weapons Station Earle near Redbank, New Jersey.

"I work from the philosophy that there is no problem that can't be solved," Diamandis professes. "Apply the right minds, technology and capital to it and anything can be accomplished. It takes the right incentive to gather the best people to a particular challenge. I think incentive prizes are able to drive breakthroughs in a way that nothing else can."

This past January, Diamandis stood beside Dr. Paul Jacobs, chairman and CEO of Qualcomm, as well as the CEO of the Qualcomm Foundation, as Jacobs delivered the keynote address to a packed crowd in Las Vegas for the Consumer Electronics Show (CES). During the address, Jacobs announced

that the Qualcomm Foundation had joined forces with X PRIZE to back its latest endeavor, the Qualcomm Tricorder X PRIZE.

That's right, kids, you read that right: *Tricorder*.

Inspired by the technology in the original *Star Trek* television series created by Gene Roddenberry, Diamandis and his team at X PRIZE dreamed up turning science fiction into a science-reality with a handheld personal heath device that helps detect up to 15 common diseases. "There is a dire need to improve access to healthcare globally and provide consumers with an opportunity to be active participants in their own health," Diamandis shared during the keynote. "The Qualcomm Tricorder X PRIZE will incent the creation of technologies that can empower the consumer with the ability to decide when, where and how to seek health information and care."

The Tricorder prize is a $10 million pool that will go to the team that develops a mobile platform that accurately diagnoses a set of 15 diseases across 30 consumers in three days. Teams must also deliver this information in a way that provides a compelling consumer experience while capturing real-time, critical health metrics such as blood pressure, respiratory rate and temperature.

As the X PRIZE Foundation looks toward the future, it has even grander plans. The company, quietly nestled at the edge of the oceanfront community of Playa Vista, California, is planning on doubling in size within the next year. "We're looking at a series of X PRIZES in broad areas," Diamandis notes. "We're looking at reinventing how we map the ocean floor, reinventing education and learning, how do we change the way our kids learn domestically and around the world, including the 70 million primary-school-age kids in Africa — how do we give them access to learning technologies?

"We're working on an autonomous auto X PRIZE," Diamandis continues, "an X PRIZE on earthquake detection, a prize on solving childhood obesity and a solution to Alzheimer's Disease. We're working on a prize that would develop a plastic that would be completely biodegradable in ocean salinity, temperatures and UV radiation... We're looking at all the fundamentals: water, food, healthcare, education. We've got 80 different prize concepts that we're working on. The question is: How do we accelerate breakthroughs in those areas? We're looking at fields that are stuck, like education and healthcare, where progress is just not happening fast enough, where there's a stigma and people feel it's not a viable place to invest capital — those are the fields we feel are ripe for disruptive innovation.

"We're living in an age where a couple guys in a garage have the ability to solve huge problems that were, previously, the purview of large companies. A small team is capable of many rapid iterations and is much more willing to take risks to achieve a goal. True innovation requires taking extraordinary risks, which is not something that large companies are willing to do — they have too much to lose. It comes down to small entrepreneurs who are willing to take those kinds of risks in order to create real breakthroughs. That's the idea of a prize: to attract maverick thinkers across disciplines, across nation states, to solve your problem."

Diamandis is passionate about pursuing X PRIZE's impossible dreams, in part by inspiring others with his own enthusiasm: "The thing that I'm really looking forward to is to taking the concept of incentive prizes to the next level, where they're a mechanism for reinventing philanthropy and driving the best of humanity to achieve breakthroughs where we need them most."

Ongoing X Prizes

Qualcomm Tricorder X PRIZE

// $10 million to be awarded in 2015

Challenge

// To create a device that will be capable of capturing key health metrics and diagnosing a set of 15 diseases. Metrics for health could include: blood pressure, respirator rate and temperature. The tool should collect large volumes of data from ongoing measurement of health states through a combination of wireless sensors, imaging technologies and portable, noninvasive, laboratory replacements.

Google Lunar X PRIZE

// $30 million prize pool to be awarded in 2015

Challenge

// For a privately funded (at least 90%) team to safely land a robot on the surface of the moon, have it travel 500 meters over the lunar surface, send video, photos and data back to Earth.

Archon Genomics X PRIZE presented by Express Scripts

// $10 million prize pool to be awarded to the first team that can complete the challenge

Challenge

// Rapidly and economically sequence 100 whole human genomes to an unprecedented level of accuracy. The 100 human genomes to be sequenced in this competition will be donated by 100 centenarians (ages 100 or older) from all over the world, which presents a unique opportunity to identify those rare genes that protect against disease, while giving researchers valuable clues to health and longevity.

Nokia Sensing X CHALLENGE

// $2.25 million prize pool to be awarded in 2013 and 2014

Challenge

// Create a real-time sensing device that collects personal data to aid people in the monitoring and maintenance of their own heath, medications and treatment regimes. The competition focuses on driving advances in lab-on-chip technology to reduce cost and size of current technology, to interlink the sensor with more devices, improve computing and communications while maintaining a high reliability and quality of data delivery as well as privacy and security. — *J.H.*

X PRIZES AWARDED

The Progressive Insurance Automotive X PRIZE

Awarded in September 2010

Challenge

Produce a car that could achieve at least 100 miles per gallon energy equivalent (MPGe) in real-world driving. The cars had to be safe, affordable and production-ready, not concepts. The mainstream class required a vehicle that would seat at least four passengers, have four wheels and a minimum 200-mile range. The alternative class opened up the design to seat two passengers, a 100-mile range and no minimum number on wheels.

Winners

Edison2 – Mainstream Class ($5 million)
Li-Ion Motors – Alternative side-by-side class ($2.5 million)
X-Tracer Team Switzerland – Alternative tandem class ($2.5 million)

Update

Edison2 continues to evolve its winning VLC (Very Light Car), which, for the competition, was actually an internal-combustion, one-cylinder, turbocharged 250cc gas engine powered by E85, but in version two is now an electric model that achieves 350 MPGe, in "a car that is roomier, friendlier and capable of meeting standards," according to Edison2's website.

Ansari X PRIZE

Awarded in October 2004

Challenge

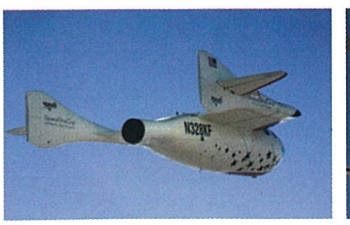
Create a manned spacecraft capable of holding three persons that would break Earth's atmosphere and reach an altitude of at least 100km, and then repeat the feat within a 14-day window.

Winner

Scaled Composites ($10 million)

Update

Billionaire Sir Richard Branson bought the rights to the winning craft, SpaceShipOne, and created Virgin Galactic to offer commercial spaceflight for individuals. For $1 million, you can charter a suborbital flight for you and your friends. For $200,000, you can be one of the first to take a flight into space, and for $20,000, put your name on the list of more than 500 people ready to launch. Since 2004, more than $1.5 billion has been invested into the private spaceflight industry.



Northrop Grumman Lunar Lander X CHALLENGE

Awarded in October 2009

Challenge

Create a vertical takeoff/vertical landing (VTVL) rocket that could move from the surface of the moon into its orbit and back. The challenge was divided into two stages: Level 1 required that teams fly their vehicles up to 50 meters, then laterally for 100 meters and land on a simple landing pad; Level

2 required the same flight pattern, but landing on a pad that simulated the surface of the moon, compete with craters. Then, after a refueling, the vehicle had to take off again and retrace its steps back to its original starting point.

Winners for Level 2

Masten Space Systems ($1 million)
Armadillo Aerospace ($500,000)

Update

Masten continues its work in creating launch vehicles. In July, it performed a successful test of its Xaero VTVL rocket that is designed to take payloads weighing up to 10kg into suborbital trajectories. The test involved the rocket launching to a height of 444 meters, staying in micro gravity (0.001 g) for just a few seconds and returning to Earth for a perfect landing. The intention is to perfect reusable launch vehicles that will enable increased flight rate, drive down the cost of space access and allow more people to reach space.

Wendy Schmidt Oil Cleanup X CHALLENGE

Awarded in October 2011

Challenge

Demonstrate new spill removal system technologies, advance systems for the removal of oil from seawater, and improve the performance of existing skimmer/boom systems technology. Teams had to achieve an oil recovery rate of at least 2,500 gallons per minute (approximately 35,714 barrels of oil per 10 hour day) from an oil spill of 1" thickness with an average oil recovery efficiency of at least 70%.

Winners

Elastec/American Marine ($1 million)
2nd Place NOFI ($300,000)

Update

Elastec/American Marine is a fully functional company dedicated to environmental products and pollution recovery systems with a focus on oil spill recovery. Its products are functional around the world, and the company was recognized by *INC* magazine as one of the 5,000 fastest-growing private companies in the U.S. *The Washington Post* named Elastic/American Marine's technology one of the best innovations of 2011 and *National Geographic* dubbed it the number two Most Hopeful Energy Developments of 2011. —*J.H.*