

Case- Altaeros Energy

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About

- **About Altaeros** Altaeros Energies was founded in 2010 to generate low cost renewable energy by harnessing the strong winds found at higher altitudes. Altaeros Energies won the 2011 ConocoPhillips Energy Prize, and has received funding from the U.S. Department of Agriculture, the California Energy Commission, and the Maine Technology Institute.
- Founded in 2010 out of MIT, Altaeros Energies early funding came from
 - the US Department of Agriculture and
 - National Science Foundation Small Business Innovation Research programs,
 - the Alaska Energy Authority,
 - the California Energy Commission,
 - the Maine Technology Institute, and
 - the Massachusetts Clean Energy Center
- Altaeros Energy <http://www.altaerosenergies.com/>
<http://www.altaerosenergies.com/about.html>

Early Team



Adam Rein – Chairman/Founder

Adam has an extensive background in the business of green energy and cleantech having held positions at the World Economic Forum and Bain & Company. In 2010 he co-founded Altaeros Energies, recognizing the opportunity presented by high level winds for clean power generation and other applications. Altaeros Energies became a founding member company of Greentown labs, the largest early stage cleantech incubator in the United States, where Adam currently serves on the board of directors. In 2013, Adam joined MissionPoint Capital Partners which focuses on providing growth investment for companies accelerating the transition to a low carbon world. Adam holds a BA from Yale University, an MPA in Business and Government from the John. F. Kennedy School of Government at Harvard University and an MBA from the Massachusetts Institute of Technology Sloan School of Management.



Ben Glass – CEO/CTO & Founder

As a cleantech entrepreneur, Ben is driven by a passion for boosting efficiency and sustainability through elegant technical solutions. He developed the idea for Altaeros Energies while conducting research on compact, efficient turbomachinery at the Massachusetts Institute of Technology's Gas Turbine Lab. After developing the initial prototypes, Ben co-founded Altaeros in 2010, and is currently leading the company to full commercialization of the technology. Ben holds a BS and MS in Aeronautical and Astronautical Engineering from MIT.



Deepak Shahane – VP Business Development

With over 30 years of experience in high technology and clean energy Deepak brings experience in both engineering and business to Altaeros Energies. After successfully selling his first company, NetPlaneSystems, Deepak held executive positions at Conexant, Mindspeed Technologies and Motorola before he founded MetaMAX Communications in 2008 where he served as CEO. After successfully building the company into one of the premier wireless data providers in India, he left the company to focus on helping entrepreneurial companies develop technology and business opportunities on a global basis. Deepak joined Altaeros in 2015 to establish the company in key initial markets, recognizing the impact the company's technology will have. He holds a B.S. from Osmania University in India and an M.S. from the University of New Hampshire.



Dr. Benjamin Bollinger – VP Engineering

Ben joined Altaeros in September of 2015 to lead the company's engineering efforts in commercializing its technology. His previous role was as Chief Engineer at Sustain X, a company he co-founded in 2007, which focused on grid-scale energy storage solutions to support a cleaner and more efficient electric grid. Ben holds a PhD in Engineering Sciences from the Thayer School of Engineering at Dartmouth where he held a variety of research positions prior to founding SustainX.



Sheri Palazzo – Director of R&D Operations

Sheri joined Altaeros in January 2016 excited to jump into the start-up world. Sheri brings over twenty years of successful product development and engineering leadership experience having previously worked at GE, Bose and Hewlett-Packard. She now leads the research and development of Altaeros' technology, pushing the engineering team step by step towards commercialization. Sheri holds a Masters in Mechanical Engineering from Northeastern University and Bachelors in Mechanical Engineering from Tufts University.

- <http://www.altaiosenergies.com/company.html>

The Buoyant Airborne Turbine (BAT)

- The Altaeros BAT integrates proven aerospace and wind turbine technology. The BAT lifting platform is adapted from tethered aerostats, which have reliably lifted heavy communications and monitoring equipment high into the air for decades. The Altaeros BAT integrates four main components:
 - **Shell** - A proprietary helium-filled shell made from high performance, industrial fabrics that lifts the turbine up and stabilizes it in the air.
 - **Turbine** - A lightweight conventional three-blade, horizontal axis wind turbine fixed within the shell.
 - **Tethers** – The lightweight, high strength tethers hold the turbine in place in all weather conditions and transmit power to the ground.
 - **Ground Station** - The portable ground station is rapidly deployed from a shipping container and includes an autonomous control system and power conditioning equipment.

Funding

- Altaeros Energies has received funding towards wind turbine technology development from a number of sources, including the U.S. Department of Agriculture, the National Science Foundation, the California Energy Commission, the Maine Technology Institute, the Massachusetts Clean Energy Center, Cleantech Innovations New England, and the Alaska Energy Authority.
- In addition, Altaeros Energies received the 2011 ConocoPhillips Energy Prize.
- This material is based upon work supported by
 - the National Institute of Food and Agriculture,
 - U.S. Department of Agriculture, under Agreement No. 2012-33610-20169 of the Small Business Innovation Research Grants Program; and
 - by the National Science Foundation under Grant No. 1248528.

BAT

- “World’s first airborne wind farm feeds energy to remote Alaska:”
 - <https://www.zmescience.com/ecology/green-living/worlds-first-airborne-wind-farm-42324/>
- Tethered blimp style wind energy generator
 - <http://tech.co/highest-wind-turbine-altaeros-energies-2014-03>
 - http://www.altaerosenergies.com/pressrelease_2012_03.html
- Material on CNN.com



MIT Grads to Test World's First Commercial Airborne Wind Turbine

- By Kent Harrington; June 10th, 2014
- <http://chenected.aiche.org/energy/mit-grads-to-test-worlds-first-commercial-airborne-wind-turbine/>
- *“After landing a cool \$1.3 million from the state of Alaska to test their new airborne wind turbine, Ben Glass and Adam Rein, the young co-founders of Altaeros Energies, became the latest poster boys representing MIT’s reputation for pumping out useful innovation. Four years ago, when the two graduated from MIT, it was obvious how much they’d had been shaped by the university’s entrepreneurial DNA. They could have walked into GE and swapped their diplomas for jobs, but they’d already built their own rival technology.”*
- *“They also had a fully tweaked **elevator pitch** and a **smart business plan** (again, courtesy of MIT), that opened a lot of angel investors’ doors, where they bagged vital seed money.”*

Plundering blimp technology

- In the grand tradition of both Effectual Entrepreneurship and the Lean Launchpad, they tried to take an affordable risk rather than going for broke. They knew that utilities are notoriously conservative and slow to implement new technologies.
- They decided to take the “**bird in the hand**” to build upon existing blimp technologies and add their own hardware and software control systems
- In 2012, they tested their Buoyant Air Turbine (BAT) at a Maine Air Force Base
- It successfully utilized the steady winds at 300 feet and produced more energy than would be expected from similar ground based turbines.
- In 2013, they successfully tested it again at 500 feet, in stronger 45-mph winds.

Rapid deployment was a competitive advantage.

- They did not need the expensive foundations, towers, and cranes that were needed to build ground based wind turbines.
 - (Foreshadowing: this would also be a huge advantage for deploying cellular towers!)
- The BAT could be brought to the site deflated and then inflated on site and deployed on cables.
- They claimed it could be transported in just two mid-size shipping containers and deployed in one day.
- The tethers would allow the power to be delivered back to a ground station and thence into the grid.
- Sensors on board could measure wind speed and forces on the BAT and send that down to the ground station, which could automatically shorten or lengthen the tethers and even bring the BAT down to the ground to dock it during intense storms that might otherwise damage it.

Heading off-grid

- Altaeros knew that the primary initial targets would be those places that did NOT already have reliable power.
- As noted in the AICHEM article:
 - *From the beginning, Altaeros targeted a small niche far off the grid: villages, islands, mines, or disaster zones that rely on expensive diesel power. And prime real estate would be anywhere a traditional turbine can't be delivered or constructed.*
 - *Altaeros' ability to reduce operating costs, particularly for Alaska, said Alan Baldivieso, program manager for emerging energy at the Alaska Energy Authority, "makes this type of deployment very attractive." The authority awarded Altaeros the grant from its Emerging Energy Technology Fund because fuel is so expensive in parts of Alaska.*
 - *As Glass and Rein prepare their 30 kilowatt BAT for its 18 month commercial demonstration, where it will fly 1,000 feet above the ground, they say it will provide power to 12 homes for \$0.18 per kilowatt-hour, about half the normal price of off-grid electricity in Alaska.*
 - *Altaeros wants to show that their turbine is less costly than the Northern Power Systems 100, a popular, 100Kw turbine built for cold, harsh climates, which has replaced many diesel generators in Alaska. While supplying power to 25 to 30 homes, the NPS 100 "Arctic Model" is capable of operating in conditions as low as -40C. (NPS company demo video) This could be a formidable challenge for Altaeros, since their turbine is always described as "conventional."*

Finding the right partners for early deployment.

- Altaeros was particularly well suited to the situation in Alaska -which helped them raise capital and recruit partners
- The Alaska Village Electric Cooperative (AVEC), a nonprofit electric utility serving 54 communities in Western and Interior Alaska, became an early partner.
- Small communities in Alaska have power needs in the range a few hundred kilowatts that put them in the range where a potential 100 kw BAT would be a good match.
- From the beginning Altaeros, and their partners realized that the BAT could be used for much more than power generation. They were particularly enthusiastic about using the BAT to deploy community based wireless technologies.
- As Ben Glass told [Technology Review](#), it can lift additional “payloads,” like weather monitoring and surveillance equipment. He thinks that the most useful addition is Wi-Fi: “If you can put a Wi-Fi unit up outside the village, you’re much higher than you’d get with a traditional tower. That would allow you to cover six to eight times the area you would with a tower.”
- Could Cellular coverage be far behind?

Designed during free time at MIT

- Ben Glass began to develop the idea during his undergraduate years at MIT. He went on to enter the MS program in Aeronautics, but he continued to work on the idea. He felt strongly that more energy could be harvested (and done more efficiently) if the wind turbines could be positioned in the steadier and more powerful winds at higher altitudes.
- He met Adam Rein in a class in Energy Ventures given by the MIT Sloan School of Management. Rein was an MBA student who was serving as a teaching assistant.
- The two worked together to flesh out the Business Model that would eventually become Altaeros.
- They located their startup in Greentown Labs in Somerville, MA. This is an incubator that is devoted to advancing clean technologies. Adam Rein was one of the founders.

MIT's real world experience

- *As wrap-up activity buzzes around him, Glass sees that his undergraduate years on MIT's Solar Electrical Vehicle Team, where he built and raced solar cars, equipped him the skills to bring the BAT from concept to reality. "Just being able to see a project from the design stage through building, testing, and operating was valuable," he told Technology Review. It's obviously helped him to lead the technical team at Altaeros to refine a new energy tool that might have an impact on the real world.*
 - <http://chenected.aiche.org/energy/mit-grads-to-test-worlds-first-commercial-airborne-wind-turbine/>

Mitsubishi invests in Altaeros

- <https://www.bloomberg.com/news/articles/2015-08-27/mitsubishi-heavy-invests-in-altaeros-airborne-wind-technology>
- Japan's Mitsubishi Heavy Industries Ltd. and Oman-based Suhail Bahwan Group have invested in Altaeros Energies Inc., a U.S. company developing airborne wind turbines, the companies said in a statement Thursday.
- The move follows the December announcement by Japanese telecommunications company SoftBank Group Corp. that it planned to invest \$7 million in Altaeros.

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- Generating power, 600m up in the air; Anmar Frangoul ; Special to CNBC.com; Wednesday, 22 Jul 2015
 - *"There's a whole bunch of different applications for it," Glass said. "One of the most exciting ones is if you look at rural areas – especially in developing markets – [where] the incumbent sources of electricity are very expensive, very dirty diesel generators."*

– <http://www.cnbc.com/2015/07/22/generating-power-600m-up-in-the-air.html>

But the market changes

- By 2017, Altaeros and their investors were beginning to realize that their approach to blimp based wind energy was struggling to compete with the lower prices of natural gas and some alternative energy sources.
- They needed a new strategy –communications.
- Softbank was one of their largest investors in 2014 investing \$7 million in the energy strategy. Now they would invest \$7.5 million in the communication strategy.
 - *“This is the second time SoftBank has funded Altaeros. Its first investment of \$7 million in 2014 was used for the development of Altaeros’ airborne wind turbines to provide renewable energy. Altaeros, whose other investors include Mitsubishi Heavy Industries and RNT Associates (Indian industrialist Ratan Tata’s investment vehicle), has now raised a total of about \$20 million.”*
 - *“SoftBank’s interest in Altaeros is understandable: not only is cleantech one of its investment focuses, but it also holds a majority stake in Sprint and SuperTower may give the telecom (and its competitors) new opportunities.”*
 - <https://techcrunch.com/2017/08/08/aerostat-startup-altaeros-gets-7-5m-from-softbank-to-bring-broadband-wireless-to-rural-areas/>

Pivot! The saga continues.

- The viability of Altaeros as an energy generator was based upon the high cost of energy. As energy prices fell, so did the fortunes of Altaeros.
- Eventually, they pivoted to address the issue of areas without cell phone coverage.
- Hiawatha Bray, in the Boston Globe, describes the new direction after the pivot:

- *“You’ll usually see blimps hovering over stadiums. But a Somerville startup called Altaeros wants to float them over isolated rural areas, as a quick, cheap way to build out the world’s wireless voice and data networks.”*

“Altaeros makes the SuperTower, a helium-filled airship equipped with a pod of cellular antennas and tethered by cables about 800 feet off the ground. The company says the radio signals from one SuperTower have a range of more than 35 miles over flat terrain, taking the place of 15 land-based cell towers. According to Altaeros, the SuperTower system would slash the cost of delivering wireless service by 60 percent.”

- *The article goes on to note that:*

- *“Clayton Funk, managing director at MVP Capital, an investment banking firm specializing in telecom companies, said Altaeros makes sense as a niche product. “I don’t see thousands of them,” Funk said. But, he added, “it is absolutely going to have a place in the ecosystem.”*

“Funk predicted that companies will use the blimps to deliver emergency communications services after a natural disaster has taken out cell towers or in rugged regions where constructing a tower would be unusually difficult.”

“Glass, though, argues that vast regions of the United States are underserved because low population density — say, around 100 people per square mile — makes it cost-prohibitive to build a network of cell towers. But just one SuperTower can cover up to 3,800 square miles. With that kind of coverage, cellular companies could make money in rural areas they’ve previously neglected.”

<https://www.bostonglobe.com/business/2019/02/18/altaeros-taking-cell-service-new-heights/ohhcH63OazyiVnNAg3GhUK/story.html>



ALTAEROS

Altaeros, a Somerville startup, tested its blimp, which carries cellular antennas and can be tethered by cables 800 feet above ground, in lieu of traditional cell towers.

By [Hiawatha Bray](#) | GLOBE STAFF FEBRUARY 18, 2019

There are competitors

- Both the TechCrunch Article and the Globe article note that there is competition in this space.
 - Globe: *“Altaeros isn’t the only lighter-than-air telecom venture. Alphabet Inc., the parent company of Google, has been working on a similar idea since 2008. Its Loon service uses untethered radio-equipped balloons, designed to ride as high as 60,000 feet up in the sky, and relay messages to each other and to the ground below, creating a low-cost worldwide digital network. Alphabet has signed a contract with the African phone company Telkom Kenya to deliver Loon service to inaccessible parts of Kenya, starting this year.”*
 - TechCrunch: *“An obvious question is what advantages does SuperTower offer over Google’s Project Loon and Facebook Aquila, which use high-altitude balloons and solar-powered planes, respectively, to provide low-cost broadband coverage? Rein says SuperTower’s key difference is that it integrates easily into existing networks. “From the carrier’s perspective, the SuperTower is just another tower type. It uses the same radios and antennas and permitting frameworks, and it provides last-mile connectivity to the end users in exactly the same way,” he explains. SuperTower is less expensive to deploy, however, and covers a much larger area. Rein claims that one SuperTower can provide coverage equivalent to 30 conventional towers.”*

Questions for discussion

- Why and how was the business plan critical to the formation of Altaeros Energy?
- Do you think that investors would have responded as well to a pitch without the business plan, but with a Business Model Canvas and Lean Launchpad approach?
- Now that Altaeros has pivoted toward communications, do you agree with their explanations for their competitive advantage over the Google and Facebook solutions?